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INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

The Shop Teachers' Professional Magazine

from this cosmic yet common dust...

Photo courtesy Mt. Wilson and Palomar Observatories.

• According to the astronomers who spend their lives delving into the mysteries of the universe, stars are formed from great clouds of dust diffused throughout the cosmos. This cosmic yet common dust consists of tiny granules of matter suspended in gases, the whole gradually collecting into nebulous spheres with a minimum observed diameter 10,000 times the earth's orbit. Under gravitational pull and the pressure of outside radiation these bodies gradually contract into unified, individual and distinctive stars.

The unified, individual and distinctive stars among men are formed in the same way . . . from the nebulous and diffuse matter of person and personality, common to all yet cosmic in its possibilities. Such men are fortunate in that their inner urges and desires were subjected to the right *outside* influences during the formative years of their youth.

Here lies the great opportunity of the true educator. He can supply the *vital outside influences* missing from the lives of many of the youngsters in his classroom. He can help establish opposition to the downward flow of human energy that peters away into flat failure. He can help oppose spirit to matter, ambition to indifference, go-do-it to sloth, and *"will!"* to "won't." And no man has greater opportunity thus to change the lives of his students than the instructor in mechanical drafting. In the freshness of the subject and in the skills to which the work leads, the instructor has opportunity to arouse one overwhelming interest that corrects diffusion of effort and energy. In the rudiments simply presented, the student gains confidence. In the recited achievements of men who have taken the same road and become engineers, the student gains the urge to go on. And no wise instructor will contradict the impression thus made by permitting the false, penny-pinching economy of cheaply made, inferior quality drafting instruments. As part of the influence he exerts, he will know the advantages of having the finest quality drafting instruments the student can afford, and insist upon these and no other.

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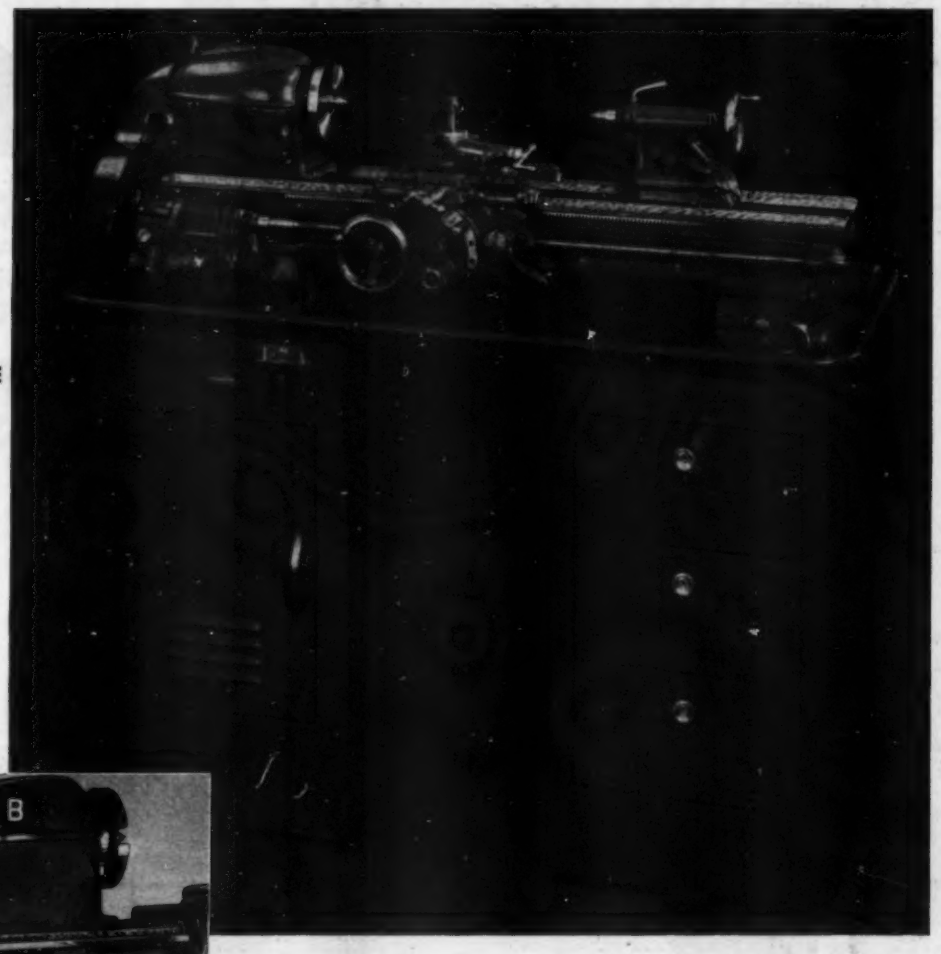
THE NATIONAL GUARD DEFENDS AMERICA

SOUTH BEND 9" x 3-1/2' MODEL A UNDERNEATH MOTOR DRIVEN LATHE

with 3-Drawer Metal Column Base



SAFETY DRIVE

B
A
C
This position of lever unlocks gear cover (A), headstock cover (B), and disengages motor drive (C) even if electric power is left on. Access is possible to gears (at A) or headstock belt drive (at B) only when these parts are not moving under power.
With lever in this position, the gear cover (A) and headstock cover (B) are locked in their closed positions, and the motor drive (C) is fully engaged.

COMPACT—ECONOMICAL

This new South Bend Precision Lathe is compactly designed to save floor space and attractively priced to meet limited budgets. It's safer; gear guard and headstock cover cannot be opened while motor drive is engaged. It's easier to operate; all controls are conveniently placed and smooth-acting. These features make teaching easier. Less supervision is required and student skills develop faster. *Send coupon for information.*

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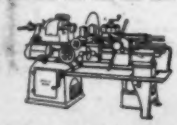
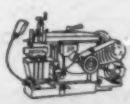


☐ ½" and 1" Collet TURRET LATHES



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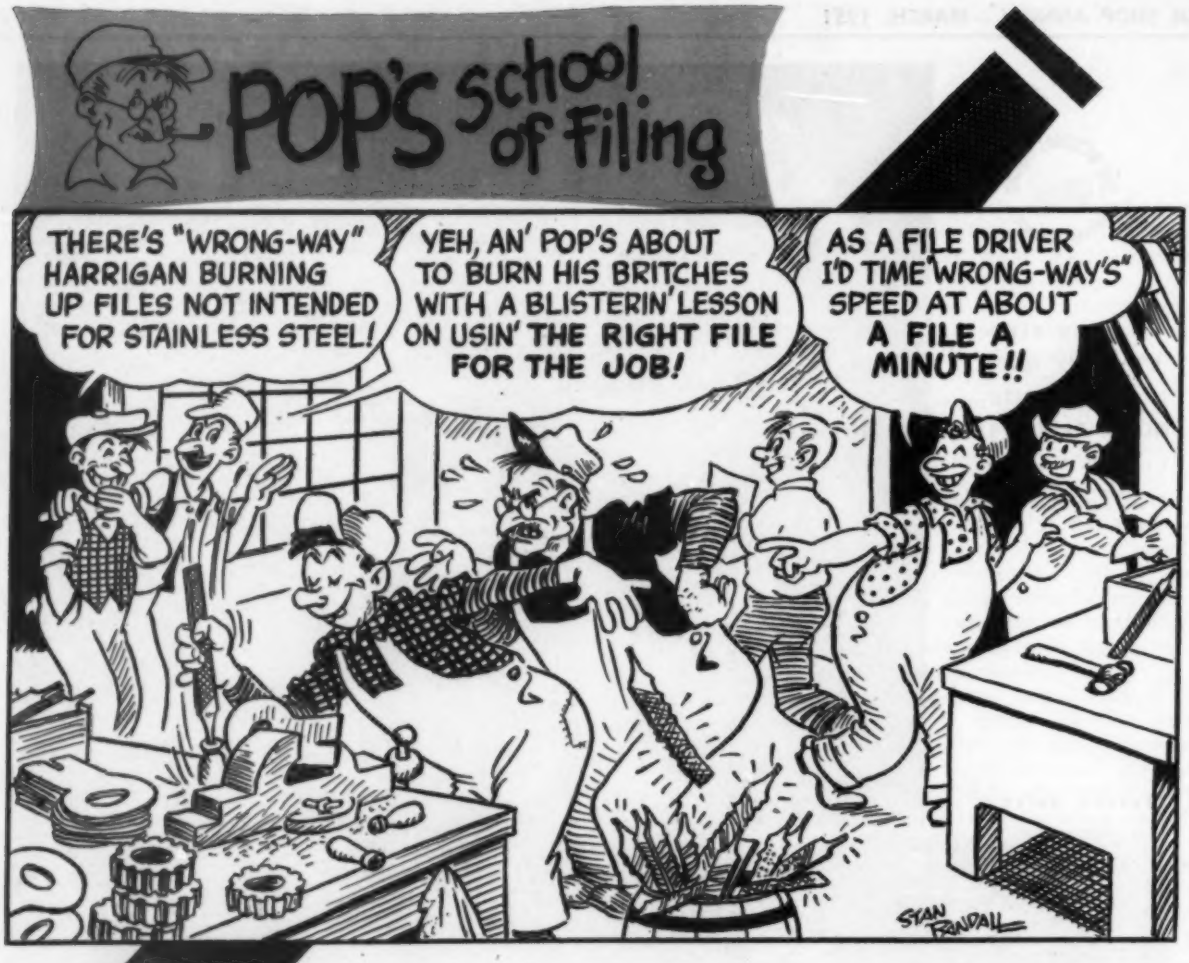
POP'S school of Filing
THERE'S "WRONG-WAY" HARRIGAN BURNING UP FILES NOT INTENDED FOR STAINLESS STEEL!
YEH, AN' POP'S ABOUT TO BURN HIS BRITCHES WITH A BLISTERIN' LESSON ON USIN' THE RIGHT FILE FOR THE JOB!
AS A FILE DRIVER I'D TIME "WRONG-WAY'S" SPEED AT ABOUT A FILE A MINUTE!!
STAN RANDALL

LIKE any foreman interested in high production with minimum tool wastes, Pop can't be blamed for "blowing his top" over the sad scene enacted above. Using the wrong file for the job is as costly a tool abuse as using any file carelessly. Take stainless steel, for example:

Stainless steel is a tough, dense metal which tends to have a wearing effect on all cutting tools —and files are no exception. Better results are obtained when Nicholson or Black Diamond files "For Stainless Steel" are selected. These are made with specially sharpened teeth to assure faster cutting and longer file life. They are made in the same types and sizes as regular-purpose files. "For Stainless Steel" is stamped on the tang. Sold through industrial distributors.

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Vol. 40 No. 3

MARCH, 1951

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

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This Month's Cover

The cover picture for the March issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION shows how modelmaking is practiced in the architectural drafting class at Dobbins Vocational-Technical School, Philadelphia, Pa.

The photograph was submitted by Benjamin J. Novak, Murrell Dobbins Vocational-Technical School, Philadelphia, Pa., and supervisor of graduate research in vocational education, Colorado A. & M. College, Fort Collins, Colo.

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Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

Harper

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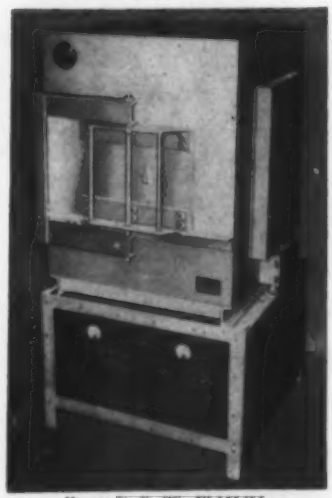

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ASSOCIATION NEWS

COMING CONVENTIONS

Mar. 15–17. **Ohio Industrial Arts Association,** at Deshler-Wallick Hotel, Columbus, Ohio. Secretary: Theodore Paige, Ohio University, Athens, Ohio.

Mar. 15–17. **New Jersey Vocational and Arts Association,** at Hotel Berkeley, Asbury Park, N. J. Secretary: Richard O. Harthmann, 63 Lexington Ave., Jersey City, N. J.

Mar. 16. **Tennessee Vocational Association,** at Nashville, Tenn. Secretary: W. A. Seeley, 202 Memorial Bldg., Nashville, Tenn.

Mar. 26. **New York State Vocational and Practical Arts,** at Rochester, N. Y. Secretary: W. T. Hudtwalker, N. Y. Board of Education, 110 Livingston St., Brooklyn, N. Y.

Mar. 26–29. **National Vocational Guidance Association, Inc.,** at Stevens Hotel, Chicago, Ill. Secretary: Campbell B. Beard, 1424-16 St., N.W., Washington, D. C.

Mar. 29–31. **Indiana Industrial Education Association,** at French Lick Hotel, French Lick, Ind. Secretary: H. G. McComb, 215 State House, Indianapolis, Ind.

MIDDLE TENNESSEE INDUSTRIAL ARTS ROUND TABLE

The Middle Tennessee Industrial Arts Round Table met at Winchester, Tenn., on December 6. The Round Table is composed of industrial-arts teachers of the area, the faculties of colleges located in middle Tennessee, juniors and seniors of these institutions who are studying industrial arts, and administrators interested in industrial education.

The next meeting was set for February 1 in Shelbyville, Tenn. The proposed program included demonstrations by student teachers of Middle Tennessee State College, Murfreesboro, on *Internal Carving of Plastics, Enrichment of Industrial Arts Projects With Flock,* and *Molding Powder Projects for Elementary Grades.*

CALIFORNIA INDUSTRIAL EDUCATION ASSOCIATION CONVENTION

The 1951 spring convention of the California Industrial Education Association will be held at Long Beach on April 13 and 14. *Safety* has been chosen as the general theme.

Dr. Wayne P. Hughes, director of the School and College Division of the National Safety Council, will be the principal speaker. He will also act as consultant to the various trade area meetings that will be included in the program.

♦ The Department of Vocational Education, School of Education, New York University, has tentatively planned to hold its Industrial Arts Spring Conference on April 20–21. The members of the Steering Committee who are planning this conference are: Kenneth Brown, assistant director, Division of Fine and Industrial Arts, board of education, Philadelphia, Pa.; Robert Campbell, state supervisor of industrial arts, Trenton, N. J.; Carlton E. Bauer, instructor, New York University; Frank Costa, instructor, Joan of Arc Jr. High School, New York City; Roy G. Fales, chief, Bureau of Industrial Arts Education, State

(Continued on page 78A)

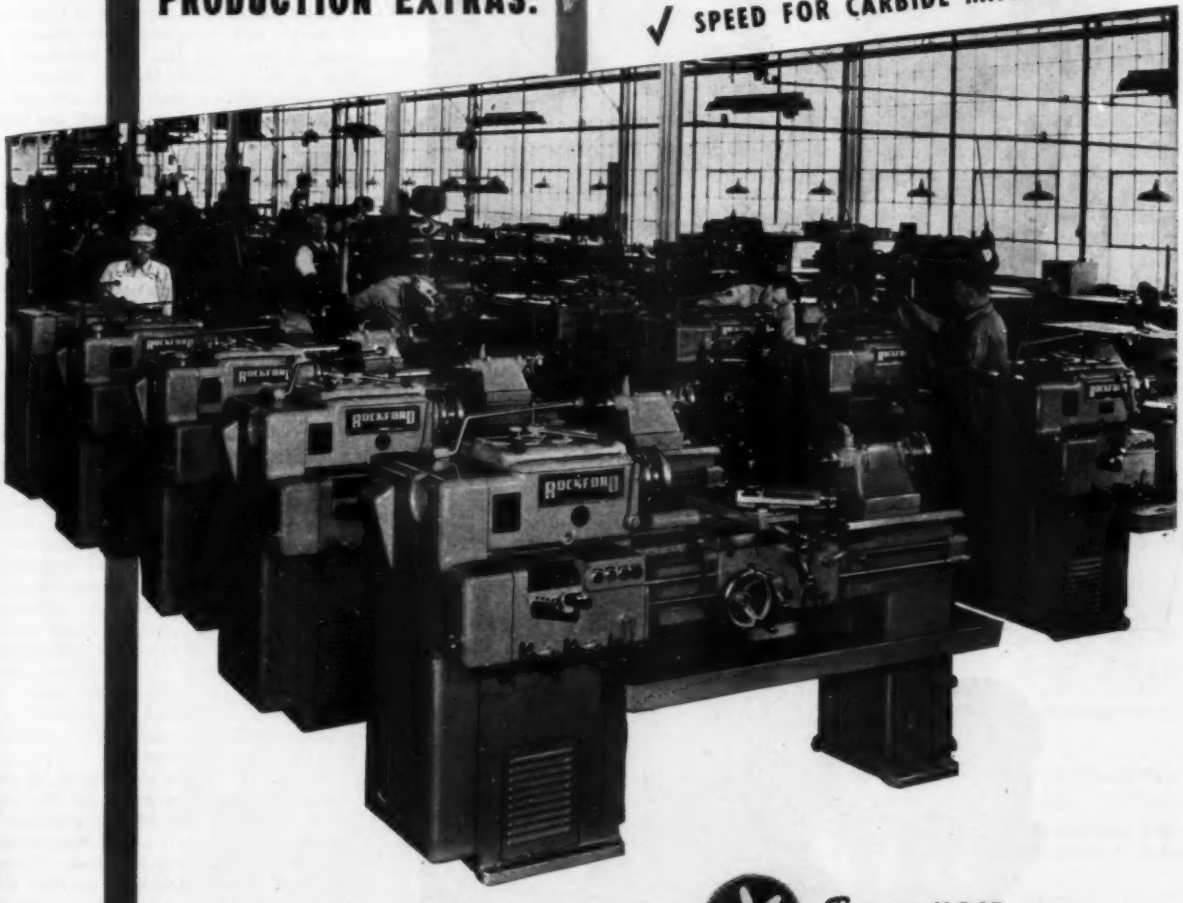
Initiates recently admitted to the Mu Sigma Pi, Industrial Education Fraternity at Wayne University, Detroit, Mich.

Standing, left to right: Ciro Taormina, A. C. Good, Kenneth Carakostas, Robert Aronson, and Denton H. Craley

Seated, left to right: Paul Grigg, Andrew Althouse, LeRoy Charlick, president, Albert Sobey, Rollin Vogan

Check THESE PRODUCTION EXTRAS:

✓ ALL-GEARED HEAD
✓ QUAD-V-BELT MOTOR DRIVE
✓ SEPARATE LEAD SCREW, FEED SHAFT
✓ SPEED FOR CARBIDE MACHINING



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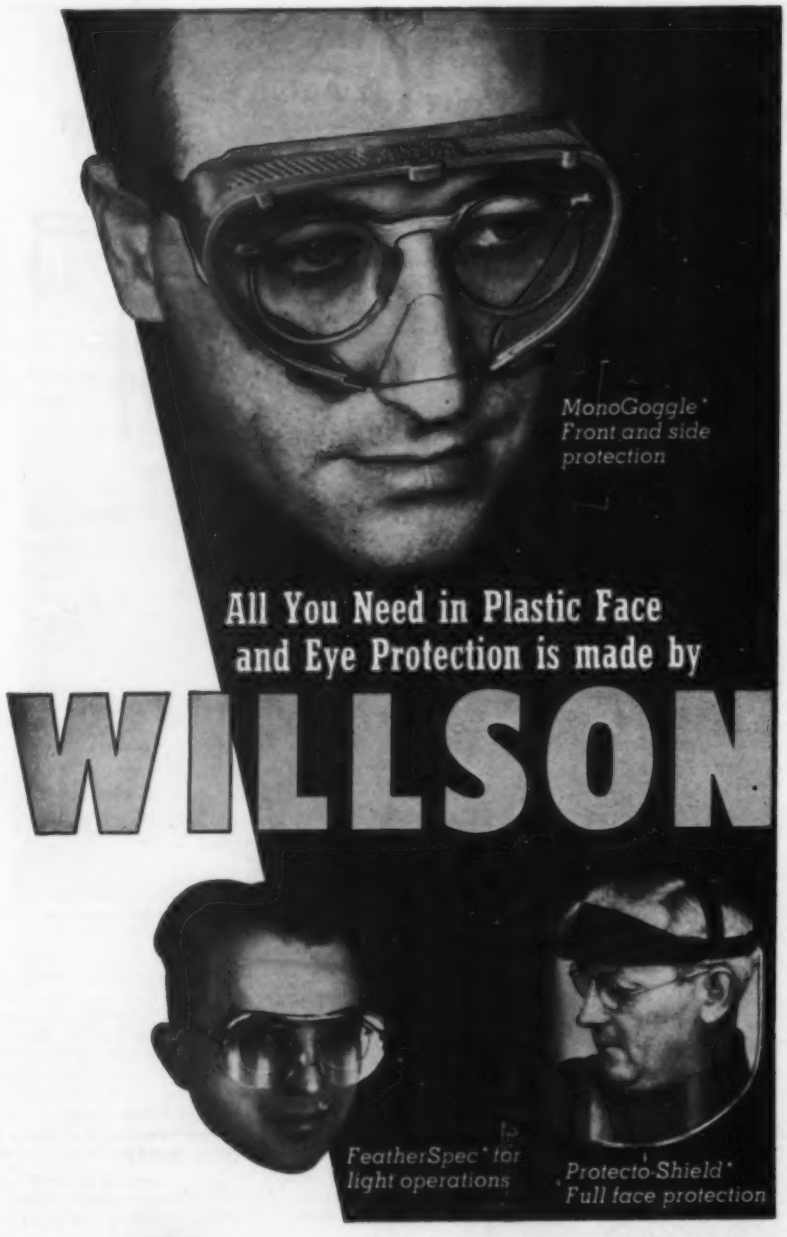

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Personal News

DR. ROBERT E. SMITH RETIRES

Upon the retirement of Dr. Robert E. Smith from the Department of Education at Ohio State University, a group of former students planned a dinner for him in recognition of his many years of service and contributions to students in the areas of Industrial Arts and Vocational Education. At the dinner on May 20, there were about 160 former students, their wives, and their friends.

Max Lerner, a former student, and supervisor of vocational education, Ashland, Ohio, served as chairman on general arrangements and the dinner meeting. Dr. William H. Stone, professor emeritus, and a former chairman of the division of industrial education, and a close friend of Dr. Smith, served as toastmaster. Brief remarks were made by Philip S. Waldeck, supervisor of industrial arts, state department of education; L. K. Replogle, assistant superintendent of schools, Columbus; John E. Fintz, assistant superintendent of special and vocational education, Cleveland; A. A. Abel, instructor, Linden-McKinley High School, Columbus; Dr. Harold P. Fawcett, chairman, department of education, Ohio State University, and Dr. Donald P. Cottrell, dean, College of Education, Ohio State University. Music was furnished by the Boys' Ensemble of Central High School, Columbus.

A special surprise feature of the evening was the announcement of the establishment of the *Robert E. Smith Student Loan* to assist worthy undergraduate students complete their college work. The fund was raised by voluntary contributions made by former students and friends. It has been placed under the administration of the Loan Foundation of the University as a fitting memorial to Dr. Smith for his many years of service in the counseling and guidance of undergraduate students in the area of industrial arts and vocational education.

On August 20, the department of education tendered a dinner program for Dr. and Mrs. Smith, at which time he was presented with a gift by his co-workers in the department.

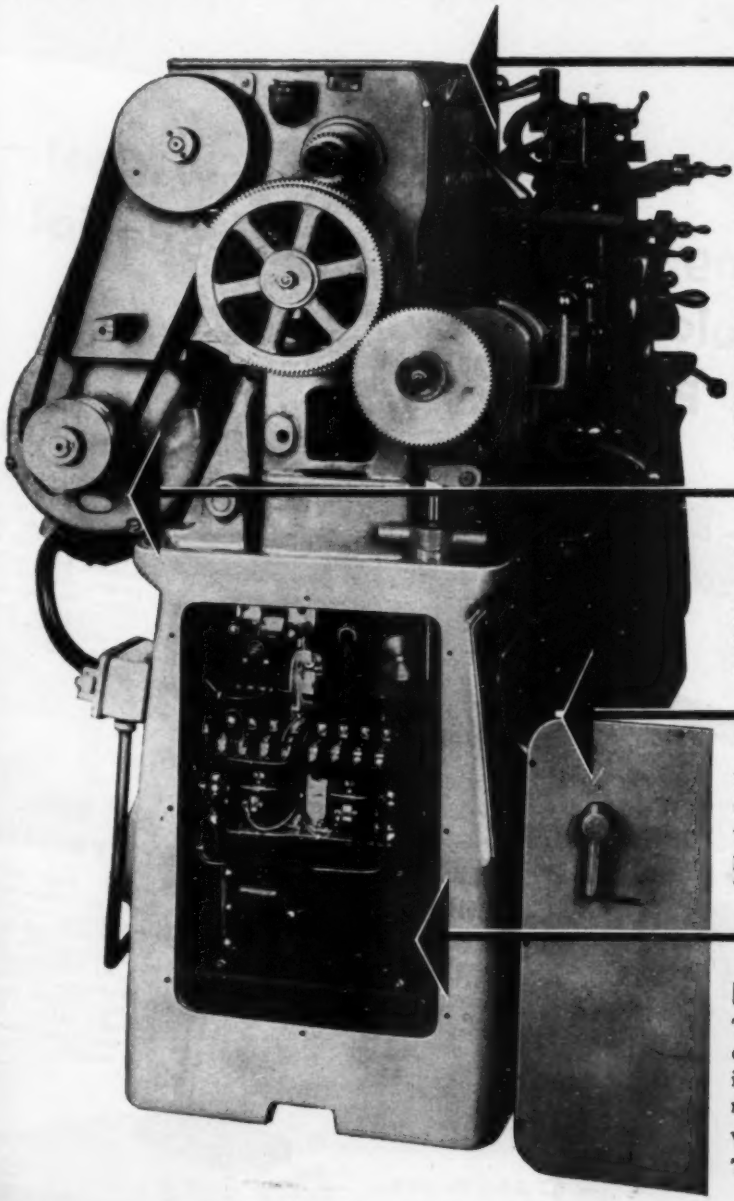
In anticipation of his retirement in June, 1950, the industrial-arts division of the Ohio Education Department conferred upon Dr. Smith the first honorary life membership to be awarded by the division. At that time, a hand-lettered scroll, indicating his membership, was presented.

The extent of his professional influences can be measured to some degree by his contributions to research in having directed 185 master's theses and eight Ph.D. dissertations during his many years at Ohio State University. He has also served as a member of a great many other doctoral committees. Another contribution to the profession has been his series of textbooks which have been so popular in the fields of industrial arts and vocational education.

Since retirement, Dr. Smith served as visiting professor at Southern Illinois University, Carbondale, Ill., during the summer quarter of 1950, and is returning for the winter quarter. During the autumn quarter, he has been serving as chairman of the education committee of the Foremans Club of Columbus, Incorporated, a member of the N.A.F., a city club affiliated with the National Association of Foremen. He also served as a panel member at the annual meeting of the trade and industrial section of the Ohio Vocational Association at a recent meeting in Columbus.

(Continued on page 22A)

pile it on a tray-top



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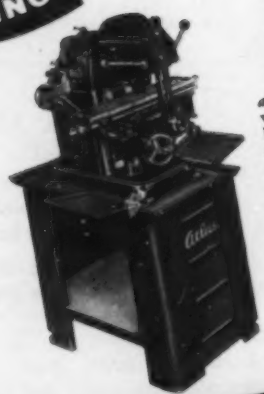

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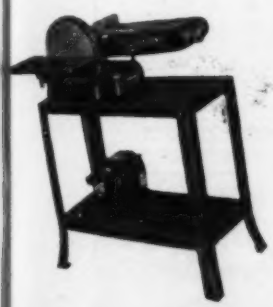

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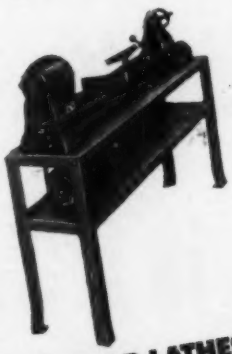

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IN thousands of shops and industries : : : Black & Decker Portable Electric Tools are the recognized standard. That's why it pays to use these same tools in your classes. Training's more realistic, students learn faster . . ! and after graduation they find Black & Decker tools used on almost every job!

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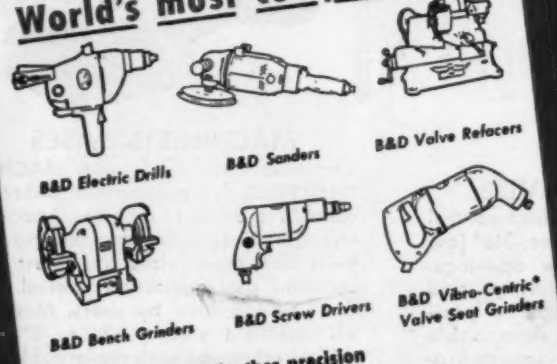
In the long run, Black & Decker tools cost you less because they outlast cheaper types. Husky working parts and sturdy castings, plus powerful B&D-built motors assure you years of extra service . . . even in the hands of inexperienced students.

This year . . . add safety, economy and better training to your curriculum. Specify Black & Decker . . . built and backed by the world's largest manufacturer of Portable Electric Tools. *Write for FREE Catalog to:* THE BLACK & DECKER MFG. Co., 680 Pennsylvania Ave., Towson 4, Md.

World's most complete line



also more than 100 other precision tools for every industrial or vocational requirement

LEADING DISTRIBUTORS EVERYWHERE SELL

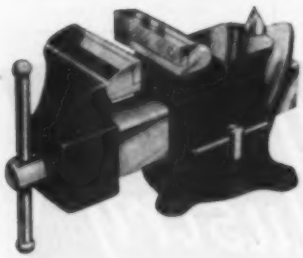
B&D Black & Decker PORTABLE ELECTRIC TOOLS

*Trade Mark Reg. U. S. Pat. Off.

COLUMBIAN VISES

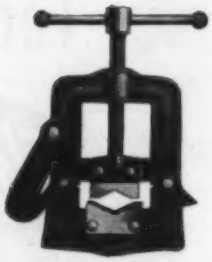
for many varied uses

There is a Columbian Vise for every need and purpose — all are made to the highest standard of workmanship and engineering.



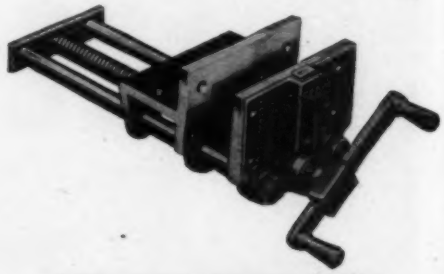
WORKSHOP VISES

Sturdily designed with covered screw, heat-treated jaw faces, "Tri-Grip" permanent pipe jaws, swivel base, 2 sizes, 3½" and 4" jaw widths and 4" and 5" jaw openings. For home workshops, garages and general use.



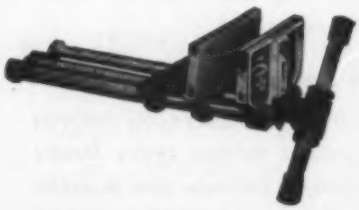
HINGED PIPE VISES

Columbian Malleable Iron HINGED PIPE Vises have self locking unbreakable hooks, tool steel pipe jaws, cold rolled steel screws and handles. Sizes for holding pipe from ⅛" up to 12". Every maintenance department should have one.



WOODWORKERS' VISES

Continuous Screw — Rapid Acting Columbian Woodworkers' Vises are finding increased uses in many plants particularly for the more ordinary types of pattern work. These durable low cost vises are sturdily built with jaw openings up to 12 inches.

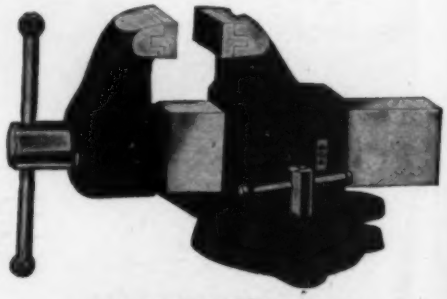


WOODWORKERS' VISES

Simple rapid acting mechanism. A slight turn of the handle engages threads of the nut and screw. A half turn tightens the vise to the work. Made in all popular sizes with jaw openings up to 12 inches.

HYDRAULIC VISE

Simple, two pedal foot control leaves both hands free. 3½" jaw widths and 6" jaw openings. Precision manufacturing and tested quality guarantee positive operation and dependable power. Saves time — speeds production — accurate work position.



MACHINISTS' VISES

Columbian Malleable Iron MACHINISTS' VISES are guaranteed unbreakable! In addition to their exceptional strength, Columbian engineering has built into these vises the finest mechanical perfection and special features appreciated by users. Made in all standard sizes — 3" to 8" jaw widths equipped with replaceable tool steel jaw faces.

THE COLUMBIAN VISE & MFG. CO.

9022 Bessemer Avenue • Cleveland 4, Ohio

THE WORLD'S LARGEST MAKERS OF VISES

Mr. Woodworker:

NOW FOUR TYPES OF WOOD BITS

THE NEW AUGER BITS } *Made with ⅜ Stock shanks,*
BIT STOCK DRILLS } *for use in Hand Braces.*

THE NEW POWER AUGER BITS } *Made with ¼" shanks for use in ¼"*
STRAIGHT SHANK WOOD BITS } *or larger Electric Drills or Drill Presses.*

All will cut clean, smooth, accurate holes and are available in convenient sets attractively packaged.

BUY FROM YOUR LOCAL DEALER

A catalog listing drills for metal, wood, concrete and glass may be had upon request.

W&B *"Makers of Fine Tools Since 1845"*

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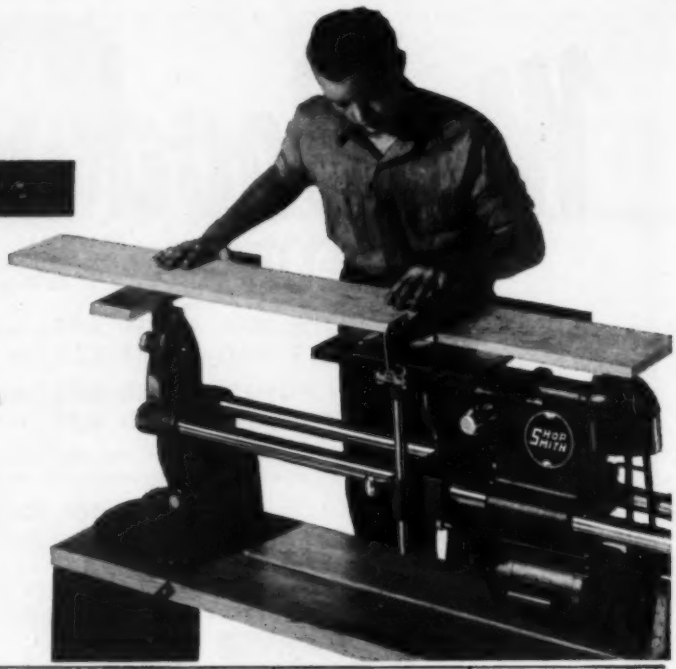
SHOPSMITH...

and the FLEXIBLE SHOP



A new concept in industrial arts education has developed around SHOPSMITH. It's the FLEXIBLE SHOP. The idea was first advanced at the California Industrial Education Association Convention earlier this year. Since then, it has grown in recognition and acceptance. It promises important changes in teaching technique. It also assures fuller utilization of shop facilities — in large schools as well as small. Here, briefly, is the idea behind the FLEXIBLE SHOP.

the FLEXIBLE SHOP

— all SHOPSMITHS set up for Lathe Instruction

— with SHOPSMITH set up for Special Projects

MODERN school shop planning calls for a variety of power tools: saw, sander, lathe, drill press, jigsaw, etc.

SHOPSMITH provides flexibility by converting from one basic power tool to another as the instructor requires. Because each SHOPSMITH can be set up as a lathe, saw, sander, vertical drill press, horizontal drill, or jigsaw, the instructor can vary his assortment of power tools to match the changing requirements of his course and the development of his class.

The FLEXIBLE SHOP puts an end to the congestion and delay which results when there is heavy demand for one or two types of tools. It means that students and machines need never stand idle.

Furthermore, it opens up new opportunities for effective instruction. Because *all* SHOPSMITHS can be set up as circular saws, or as lathes, or as drill presses, it permits the use of practice projects to teach correct and safe use of each machine. It permits hitherto impractical tool assortments.

In each basic position, SHOPSMITH is essentially the same as a high-quality, single-purpose power tool. In terms of capacity, precision, and durability, it will equal or outperform the tools it replaces. But only SHOPSMITH offers the added advantage of flexibility.

Basic SHOPSMITH, less motor, costs $189.50; with special school guards, $197.95. It provides the most efficient power tool work station for your shop.

SHOP SMITH

SHOPSMITH

Dept. 136-U at factory nearest you: 12919 Colt Rd., Cleveland 8, Ohio, OR 417 Montgomery St., San Francisco 4, Calif.

Please send me complete information about the FLEXIBLE SHOP and the applications of SHOPSMITH to industrial arts education.

*Name*_____ *Position*_____

*School*_____

*Address*_____

*City*_____ *State*_____

TEACHERS EVERYWHERE

NOW USE THIS GENUINE HIDE GLUE

NO MIXING
NO HEATING
NO CHILLED JOINTS
NO ODOR

AVAILABLE IN 6 SIZES
TUBE, QUARTER-PINT, HALF-PINT, PINT, QUART AND GALLON

HIDE GLUE AT ITS BEST

Exactly like the fine old hot hide glue you know is best for all woodwork—yet it is ready to use right out of the can. No waste because of over-mixing or spoilage. Ready when classes start. Foolproof for beginners.

WILL NOT DULL TOOLS

Franklin hide glue never gets hard or brittle. It is resilient and tough like raw hide. It is easy to use and easy on tools.

DOES NOT STAIN WOOD

MAKES JOINTS STRONGER THAN THE WOOD ITSELF

Tests prove more than 4000-pounds-per-square-inch strength. Stronger than any wood.

HAVE YOU MADE THIS TEST?

1. Squeeze a little Franklin Glue on a piece of glass or clean wood. Squeeze out the same amount of any other liquid glue beside it.

2. Let set overnight, then compare the two. Leave for two or three days and note the difference.

FREE

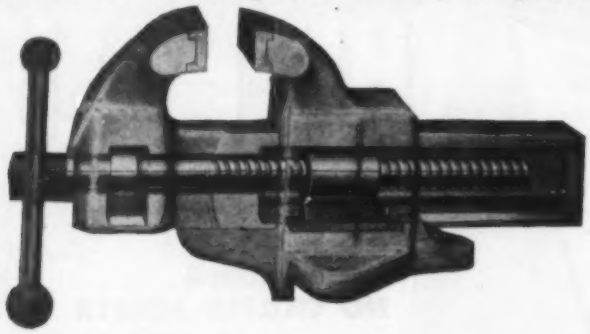
Samples sent when request is made on official school letterhead

The Franklin Glue Co.
129 W. Chestnut St.
Columbus 15, Ohio

THE CHOICE OF FINE CRAFTSMEN EVERYWHE
USED BY MANUFACTURERS OF QUALITY TURNI

MORGAN SEMI-STEEL VISES

Engineered to Fit Every School Shop Requirement



DEPENDALBE STRENGTH is obtained by the use of a special charcoal iron casting, tested and proved by actual breaking strain. Strength is present where strength is needed.

RIGIDITY an all important factor, is a feature of the Morgan line. Careful and accurate machining of the sliding bar, working to close limits, insures this extra rigidity which is so essential.

THE JAWS are milled parallel and fitted with interchangeable tool steel faces. These steel faces are driven on the vise and then held firmly with special tapered screws to insure absolute tightness. These jaws may be removed when battered or worn thus adding years to the life of the vise. Our standard jaw faces are diamond created to insure a firm gripping power.

SMOOTH JAWS will be furnished at no extra charge on request.
THE SCREW is a solid steel forging, cut with Acme threads and gauged closely to insure gripping power. The handle of the screw is one piece, the balls being forged on each end.

THE NUT in which the screw engages is made of malleable iron and fits snugly into the slot of the body of the vise. This part is easily replaceable, if necessary.

. . . all handles and side locks now nickle-plated — rust-proof . . .

MACHINISTS' BENCH VISE
Solid Jaw and Stationary Base

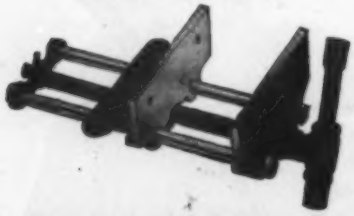
Dependable strength and extreme rigidity is obtained in the Morgan line of machinists' vises, by the use of a special semi-steel casting and the accurate milling of the sliding bar to snugly fit the broached opening in the base. The jaws are milled parallel and have interchangeable tool-steel faces which may be renewed when battered or worn thus adding years to the life of the vise. The screw is a solid steel forging engaging in a malleable iron nut Acme threaded. This vise is unsurpassed for strength, rigidity and durability. All parts interchangeable.

MACHINISTS' BENCH VISE
Solid Jaw and Swivel Base

All the strength and rigidity of our stationary base vises is maintained in the swivel base series by careful workmanship and close inspection; all engaging parts are milled to insure smooth and perfect working. This vise may be swung and clamped in any desired position; a specially designed nut for locking the base at any angle makes it impossible to turn the vise when in use and prevents any play which would destroy the rigidity. Our new and improved base gives a low construction which is very desirable. All parts are interchangeable.

Swivel base vises 5" and larger have double swivel locking attachment.

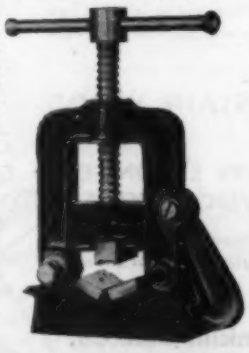
QUICK ACTION VISE



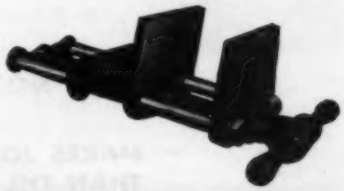
The working action is the most simple and effective of any of the screw adjusting type. The screw, having intercepted threads, operates in a half nut, a slight turn of the handle disengaging the screw and permitting jaw to slide back and forth at will. A turn in opposite direction engages screw with nut, holding the work firmly in place. Furnished with or without stop in the front jaw.

MORGAN HINGED PIPE VISE

Made of high grade malleable iron and backed by the same guarantee as all MORGAN VISES. Standard self-locking hook, cold rolled screw and handle, and oil tempered tool steel pipe jaws make this one of the finest vises on the market. Made in 4 sizes — ⅛" to 2" — ⅛" to 3½" — ⅛" to 3½"—⅛" to 4½".



SOLID NUT CONTINUOUS SCREW VISE



Designed and built to withstand the most severe service. The extra heavy Cold Rolled Screw and SOLID NUT will last a lifetime. Every part carefully and accurately machined and interchangeable, cold rolled side bars threaded and held in place by hexagon nuts — not riveted. Stop in front jaw. Furnished with hardwood or steel handle.

MORGAN VISE CO. 108-112 N. JEFFERSON ST., **CHICAGO 6, U.S.A.**

Rounding Out

BUSS Adds the No. 248

THE FINEST
DOUBLE SCREW HOIST
24" PLANER EVER BUILT

CAPACITY 24" x 8"

NEVER before in the history of the woodworking industry has a low-cost planer of this capacity combined so many of the definitely proven fine planer features that assure fast, accurate production and years of trouble-free service.

1 CAST BASE: Extra heavy, one-piece, semi-steel — to avoid vibration.

2 SEPARATE CENTER BED for greater accuracy — normalized, hard finish for longer wear. DOUBLE-SCREW BED ADJUSTMENT.

3 SECTIONAL CHIPBREAKER: Drop-forged steel. Compensates for varying stock thicknesses. Our standard design.

4 SECTIONAL FEED ROLL: BUSS standard design with staggered splines for perfectly smooth roll action.

5 CHOICE OF FEEDS: Two or four rates, or variable. Greatest flexibility.

6 CHOICE OF CUTTERHEAD SPEEDS: Motor on arbor, 3600 RPM; V-belted or with frequency changer, 4,000 to 6,000 RPM, to best suit your needs.

7 REMOVABLE PRESSURE BAR for easy checking and maintenance.

8 SHEARING BAR to prevent shaving printing and damage from loose knots.

9 MICRO ADJUSTABLE GRINDING AND JOINTING UNITS. Large, heavy rail and head.

10 BUSS GEARING, compensating through reduction unit, running in lubricant. Fully enclosed.

For complete description write for Bulletin No. 60

This machine and our No. 208 — 20" planer are exceptionally well suited to school shop training. Write for further details.

BUSS
SINCE 1862
MACHINE WORKS

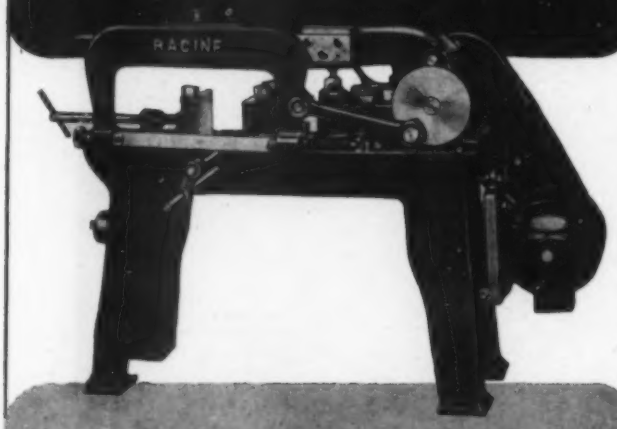
PLANER SPECIALISTS EXCLUSIVELY

A SENSIBLE INVESTMENT IN ANY SHOP...

RACINE

"Utility"

METAL CUTTING SAWS



PAY FOR THEMSELVES BY THE SAVINGS THEY MAKE

Metal cutting, in any shop, can be surprisingly expensive with slow, inaccurate, outmoded equipment. The RACINE Utility is modern, fast and accurate — yet low priced. Simple to operate, easy and economical to maintain, it pays its way. Compact, it occupies little space.

The Utility is a dependable performer in all metals from soft tubing to hard alloy steels up to 6" x 6". Pressure and feed of the saw blade are hydraulically applied for smooth, oil-cushioned operation. Available in the Dry Cut model, shown above, and in the Wet Cut model with base-enclosed coolant reservoir.

The RACINE line is complete, with models in all work ranges. Capacities from 6" x 6" to 20" x 20". Write for descriptive literature and prices. Address Racine Tool and Machine Company, 1780 State Street, Racine, Wisconsin.

If you have a job that can be done hydraulically, it will pay you to investigate RACINE Oil Hydraulic Pumps, Valves and Boosters. Write for new catalog P-10-D.

RACINE

STANDARD FOR QUALITY AND PRECISION

ALL Your Industrial Art Needs AT YOUR FINGER TIPS

THE *one big* Brodhead-Garrett master catalog brings you from *hundreds* of supply sources the newest most modern machines, equipment and supplies you need in your industrial training program.

It simplifies your buying, and brings you sharp economies all along the line, because:

1. You deal with one long experienced supply source.
2. You place but one order to get the products of hundreds of different manufacturers.
3. You save clerical and bookkeeping costs because of less paper work, fewer purchase orders, invoices and checks.
4. You save many freight and cartage charges unavoidable when spreading your buying among many sources.
5. You get quality merchandise, quality service, and low prices.

Don't delay enjoying the advantages of doing business with "America's headquarters for Industrial Art Supplies."

If you haven't received your NEW 1951 B-G catalog, write for your copy.

1 REQUISITION RESPONSIBILITY BOOKKEEPING ENTRY

BRODHEAD GARRETT CO.

"EVERYTHING IN INDUSTRIAL ART SUPPLIES"

4560 E. 71th STREET CLEVELAND 5, OHIO

MORE AND MORE SCHOOLS TEACH

Porto-Power METHODS...

7 BIG REASONS WHY

"Porto-Power" is a combination of a specialized hydraulic jack and attachments which can be adapted to push, pull, press, clamp, spread and bend. Easy strokes on the hand pump transmit oil under pressure to the compact ram — which operates at any angle.

A POPULAR KIT FOR SCHOOLS is this SA-18 "Bantam Porto-Power" Assortment. Its hydraulic unit has a 2-ton capacity which handles 90% of all body panel rebuilding requiring hydraulic power. The kit includes 23 attachments. Other "Porto-Power" units are available (in 2, 7, 10, 20 and 50-ton capacities) for schools with large budgets. The SA-18 "Bantam" Kit is a practical, basic minimum to demonstrate "Porto-Power" methods.

1. **"Porto-Power" is the easiest, most simple** hydraulic service equipment to use . . . causing its popularity in both schools and actual service.

2. **Students learn to operate what they later will employ in their work.** It is by far the most popular hydraulic service equipment.

3. **Only "Porto-Power" serves the full range of automotive rebuilding jobs.** Rebuilding operations are a major phase of automotive service.

4. **Only "Porto-Power" offers hydraulic tools for general automotive repair work.** It is thus important to students who will specialize in general repair service.

5. **Implement and tractor maintenance** requires "Porto-Power." Its use is promoted by leading tractor manufacturers.

6. **"Porto-Power" is popular in industry** — for maintenance and production. It is also important in laboratory and construction operations.

7. **"Porto-Power" is a major tool in the electrical field** for installation of pipe and conduit and in other electrical construction and maintenance.

BUY BLACKHAWK PRODUCTS FROM YOUR HOMETOWN AUTOMOTIVE JOBBER. Also, leading Industrial Supply Distributors are a source for Blackhawk Industrial equipment. IMPORTANT! Only Blackhawk makes "Porto-Power!"

BLACKHAWK

HYDRAULIC JACKS — Blackhawk offers the preferred and most complete line of Hand and Service Jacks.

'RECK-RACK'—This low-cost device rigidly holds body sections for off-the-car roughout and metal finishing.

WRENCHES—Save up to 40% on socket wrenches —yet equip students with the world's finest professional tools.

FREE — One copy to a school! This valuable "Porto-Power" shop manual will be sent to INSTRUCTORS for textbook use. Simply send the coupon today.

BLACKHAWK MFG. CO., Dept. PS231 Milwaukee 1, Wis.
Send free "Porto-Power" shop manual.

Name.....

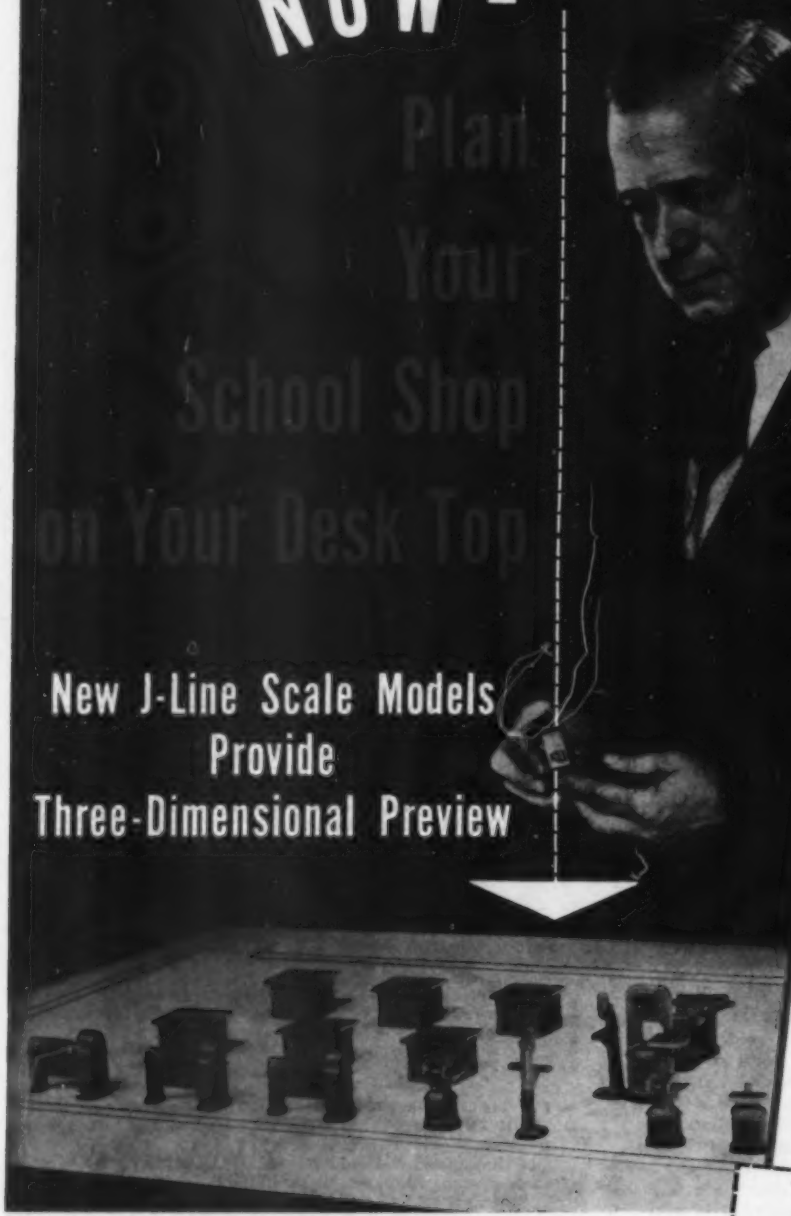
Position.....

School.....

Address.....
Street City State

NOW - Plan Your School Shop on Your Desk Top

New J-Line Scale Models Provide Three-Dimensional Preview



Fred S. Darling, Supervisor of Industrial Arts, Public Schools of Beloit, Wisconsin, demonstrates value of J-Line scale models in planning a school shop.

GUESSWORK'S gone from school shop planning when you use these new models of Yates-American's popular J-Line machines. Every machine in the line is accurately reproduced — 1/2 inch to the foot — to enable you to check your projected arrangement on a similarly scaled drawing. That means you can be sure your layout will provide the greatest possible convenience, safety and space economy.

J-Line machines lend themselves to effective planning, too. The strong family resemblance in their clean, modern design will help you to make your shop look more efficient and attractive than ever before. And J-Line quality isn't just "skin-deep," either. These machines are safe, accurate, sturdy . . . ideal in every respect for use in your shop.

You can either buy these realistic models outright, or borrow them for sixty days. For complete details, fill in the attached coupon and mail it today.

YATES-AMERICAN MACHINE COMPANY
Beloit, Wisconsin

Please send me all the facts on your J-Line scale model offer.

NAME .....

SCHOOL .....

POSITION .....

ADDRESS .....

CITY ..... STATE .....

Yates-American
MACHINE COMPANY—Beloit, Wisconsin

BAND SAWS • LATHES • JOINTERS • SHAPERS • SURFACERS
SANDERS • CIRCULAR SAWS • MORTISERS • KNIVES

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

MARCH 1951

Industrial Arts at Georgia Teachers College

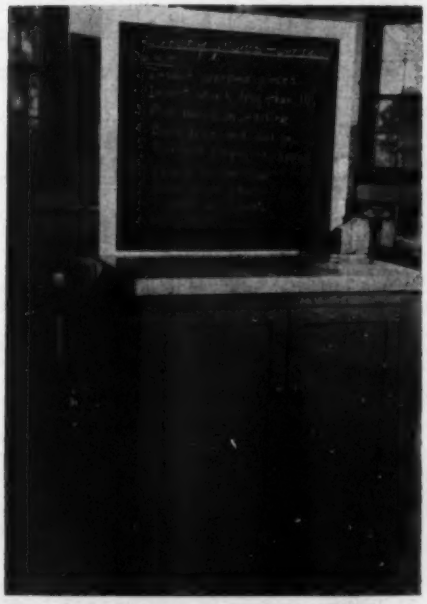
DONALD F. HACKETT
Head, Industrial Arts Department
Georgia Teachers College
Collegeboro, Ga.

In 1936 the president of Georgia Teachers College, realizing the need for a more extensive college program, proceeded to find competent personnel and introduced industrial arts to the state of Georgia.

The first shop was in the basement of the gymnasium, a space about 25 by 90 ft. and with about 7 ft. of head room. With a great deal of energy and resourcefulness and very little money, the faculty and students burrowed further under the gymnasium floor to enlarge the shop to a size of about 50 by 90 ft. All equipment that it was possible to manufacture in the shop was produced in keeping with the best standards of design and construction. The quality of the work can best be illustrated by pointing out that it is in use today and still in excellent condition.

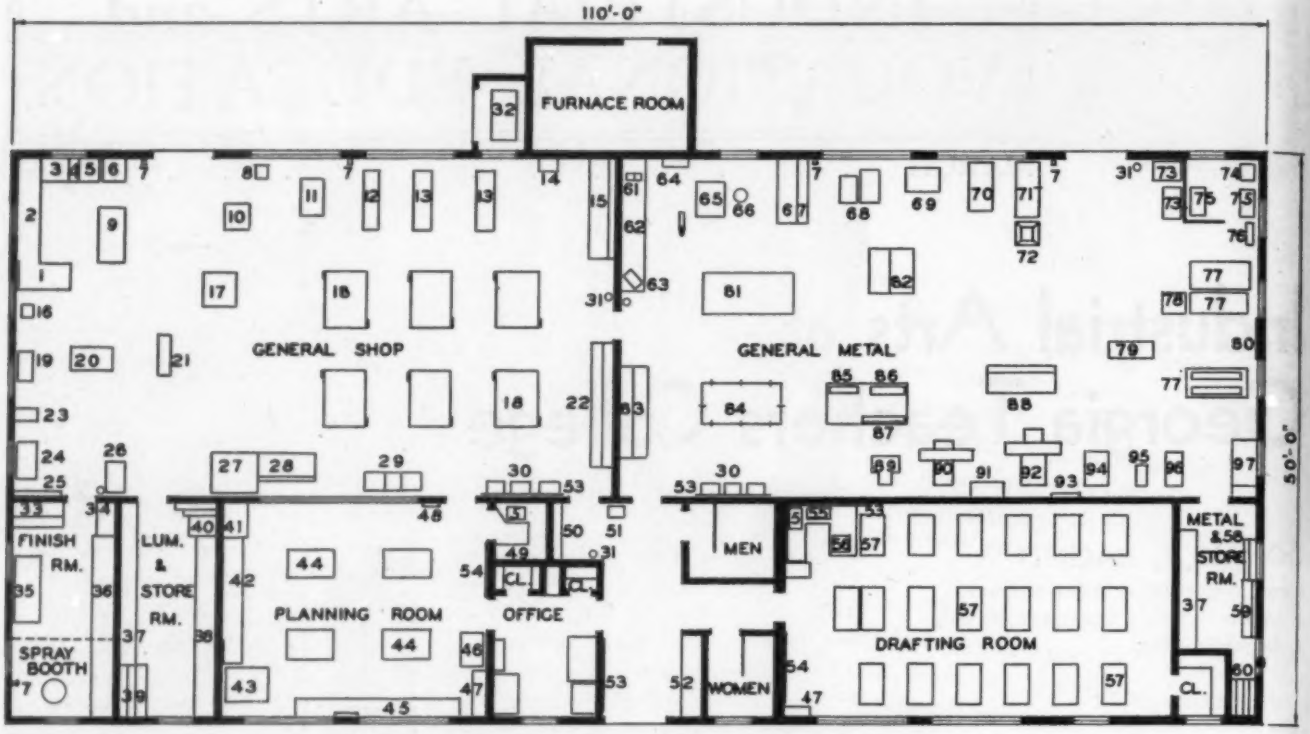
Following Word War II the demand for industrial arts increased and additional equipment was procured to increase the variety of offerings. This growth resulted in the construction of the present temporary industrial-arts building which was planned and set up by Dr. Ivan Hostetler, John Erickson, and students majoring in this department in the spring of 1948.

This new industrial-arts building is equipped with fluorescent lights throughout and is decorated in color dynamics. The floors are of concrete in the shops and are covered with asphalt tile in the drawing room, planning room, hall, and office. Two large attic fans cool the building in the summertime and forced hot air provides wintertime heating. Propane gas is used



Portable demonstration table

(Left) Plastics-ceramics area. Device on left contains infra-red lamps for heating plastics. (Right) General shop tool panel



Georgia Teachers College Industrial Arts Department

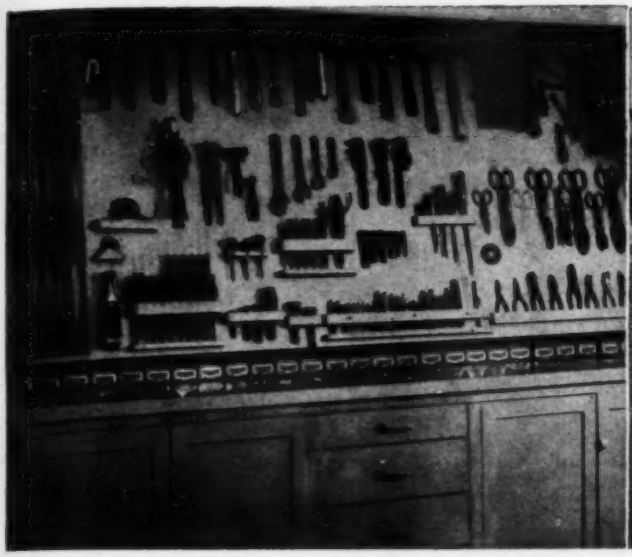
1. Plastics bench
2. Ceramics bench
3. Potter's wheel
4. Clay bin
5. Sink
6. Kiln
7. Air outlet (compressed)
8. Whetstones
9. Plastics work bench
10. Shaper 11. Band saw
12. Lathe
13. Lathes
14. Tool grinder
15. Electric panel
16. Plastics buffer
17. Circular saw
18. Woodworking benches
19. Portable table
20. Surfacer
21. Jointer
22. Woodworking tool panel
23. Drill press
24. Portable glue table
25. Clamp rack
26. Jig saw
27. Radial saw
28. Table extension and scrap box
29. Saw filer
30. Wash basins
31. Fire extinguishers
32. Air compressor
33. Finish cabinet
34. Broom closet
35. Finish table
36. Drying and project storage shelves
37. Supply storage cabinets
38. Vertical lumber rack
39. Short stock rack
40. Plywood storage
41. Type cabinet
42. Silk screen and composing table
43. Platen press
44. Planning tables
45. Leathercraft bench and tool panel
46. Portable demonstration table
47. Shop library
48. First aid cabinet
49. Darkroom (photography) table
50. Students' coat rack
51. Water cooler
52. Display case
53. Bulletin board
54. Blackboard
55. Blueprint machine
56. Paper cutter
57. Drafting tables
58. Short stock rack
59. Vertical bar stock rack
60. Sheet metal rack
61. Soldering furnace
62. Soldering — Project storage bench
63. Drill press
64. Foundry metal storage
65. Forge
66. Gas melting furnace
67. Foundry bench
68. Grinder-buffer combinations
69. Belt grinder
70. Auto engine
71. Auto mechanics workbench
72. Portable auto mechanics tool panel
73. Motor testers
74. Arc welder
75. Welding tables
76. Gas welding truck and tanks
77. Lathes
78. Lathe worktable
79. Power hack saw
80. Lathe tool panel
81. Sheet-metal table
82. Squaring shear and scrap box
83. Metal tool panel
84. Bench metalwork bench
85. Stake plate
86. Bar folder
87. Slip roll former
88. Box and pan brake
89. Universal tool grinder
90. Surface grinder
91. Milling tool panel
92. Milling machine
93. Drill panel
94. Floor model drill press
95. Arbor press
96. Metal shaper
97. Electroplating bench and rectifier

in the soldering and melting furnaces. The accompanying shop floor plan and pictures show the equipment and organization as it exists today.

Three instructors, John Erickson, Edgar Godfrey, and the writer make up the college staff while Jones Pelts teaches industrial arts in the laboratory high school and serves as critic teacher for the students doing their practice teaching in his shop. Other teachers in this region also serve as critic teachers when students are placed in their shops in the off-campus practice teaching program.

All shop courses offered in this department are either composite general shop courses or general shop courses in the major areas of wood, metal, and electricity. The requirements for a major in industrial arts involve: two general shop courses providing opportunity for work in sketching, planning, wood, metal, leather, plastics, ceramics, graphic arts, photography, electricity, home mechanics, and auto mechanics; general drafting; general woodworking; general metalworking; general electricity; design and school shop planning; content and methods of teaching; and an elective from advanced wood, metal, drawing, or architectural drawing. Each course meets for nine hours a week for one quarter. Unit type shop courses have purposely been avoided as the majority of graduates teach in general shops only and are better prepared to carry on this type of activity having previously experienced it. Those who do enter unit shops experience little difficulty in adapting themselves to the situation.

In addition to the major, courses are offered leading to a minor and an area major and by additional work a student



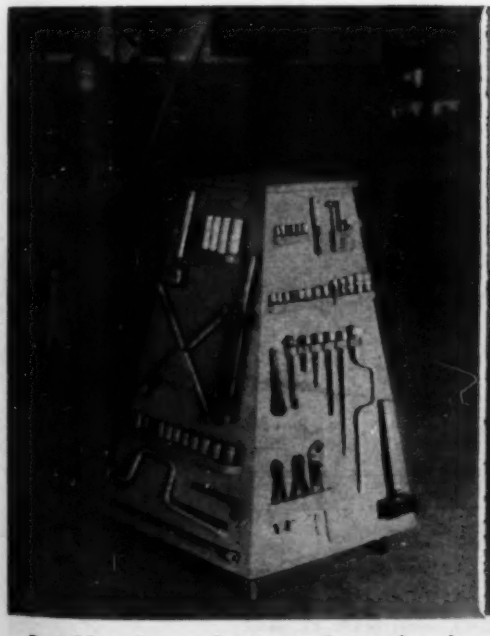
General metal shop tool panel. Note method of storing files to prolong their life

View of machine area of general metal shop

may prepare himself to conduct diversified-co-operative-training programs. One unique feature of the program at this institution is a two-year general education — core curriculum in which every man who is working toward a degree, regardless of the field, is required to complete one course in general shop or home mechanics. Every person who plans to teach on the elementary level is also required to complete a course designed to fill the needs of elementary teachers as they involve tools, materials, methods, and procedures. As a result many women and every man who graduates passes through this department. This introduction to industrial arts has resulted in many excellent industrial-arts teachers who might otherwise never have known of this area of work. For those who teach other subjects, the work they performed in this course helps to broaden their viewpoint of education in general.

With the coming of the next school year a two-year technical course is to be offered to provide college level technical training for this region. In addition to a variety of shop and drawing courses, students will complete a minimum in mathematics, English, social studies, economics, and science.

At this time, plans are being completed for a new and permanent arts building in which this department will occupy the first floor. With the present world situation what it is, the date for the completion of the building is in the distant future.



Portable auto-mechanics tool panel — also used for repair of machines in shop

Soldering bench with gas furnace. Student lockers beneath. To right is forge and gas melting furnace for foundry

Planning the Comprehensive General Shop

WELCOME E. WRIGHT
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College Station, Tex.

At one time or another every industrial-arts teacher is called upon to plan a new industrial-arts laboratory or carry out an extensive remodeling program. Most teachers accept this responsibility with pleasure and enthusiasm and perform their task in an efficient manner. Others apparently give little thought to the problem until the building has been completed or the construction has proceeded too far for their ideas to be considered.

A Practical Problem

One of the objectives of this article is to remind the industrial-arts teacher that he should be just as articulate during the planning and construction of the laboratory as after it is completed. The idea of planning the comprehensive general shop can be best presented by discussing a recently constructed industrial-arts laboratory in Kingsville, Tex. Up until the past five or six years, the only major industry in Kingsville, Tex., was the Missouri-Pacific Railroad Shops, but recently such major companies as Humble Oil and Refining Company and the Celanese Corporation of America have established plants there. These activities have resulted in an increased population as well as realization on the part of the Kingsville public school officials that its youth should be given an opportunity to acquire the skills and knowledge that is obtained from planning and building useful projects with tools and materials typical of modern industry.

Even though no phase of industrial arts had ever been offered in the Kingsville public schools, they did have a young man on their staff, Mr. Tommy L. Evans, a graduate of the industrial education department at the A. & M. College of Texas, who was in charge of their part-time co-operative education program. When the final decision was made that industrial arts should be offered in the Kingsville public schools, Mr. Evans was made responsible for the development of a program, including the planning of the shop.

Study of Pertinent Factors

Realizing that many things must be taken into consideration and that much forethought and sound thinking must be given to the establishment and planning of an industrial-arts laboratory, Mr. Evans made a diligent effort to obtain information and did take advantage of every opportunity to show the school officials all features that would bring about a more efficient industrial-arts laboratory. Numerous other school systems offering industrial arts were visited, and the industrial education department at the A. & M.

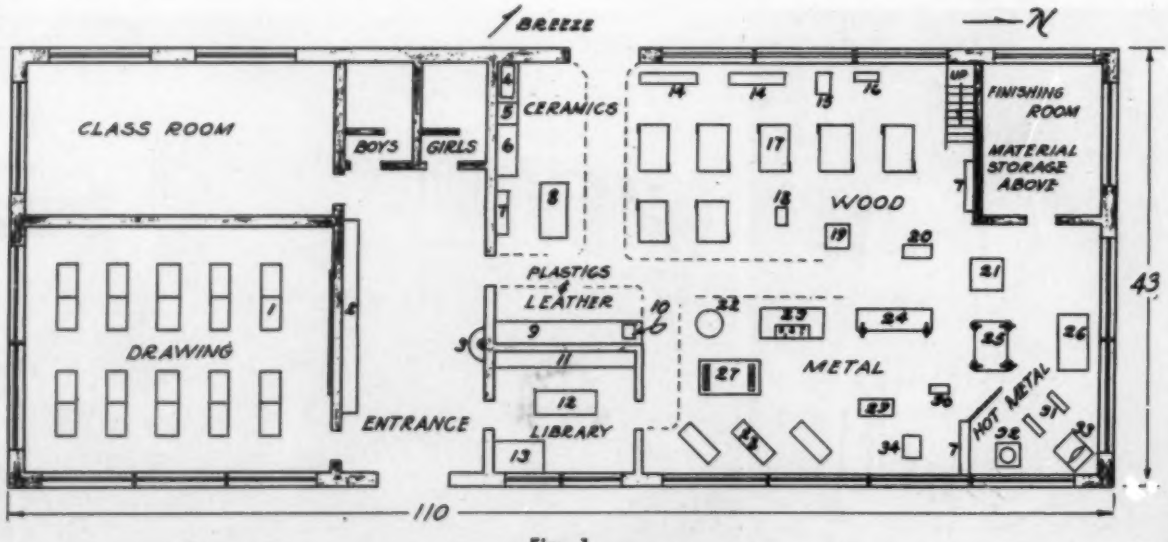

Fig. 1

1. Drawing desk; 2. display; 3. drinking fountain; 4. sink; 5. kiln; 6. cabinet; 7. tool panel; 8. ceramics bench; 9. plastics and leather cabinet; 10. heating unit; 11. bookcase; 12. library table; 13. desk; 14. wood lathe; 15. jig saw; 16. belt-disk sander; 17. woodwork benches; 18. band saw; 19. table saw; 20. jointer; 21. wood shaper; 22. wash fountain; 23. sheet-metal bench; 24. solder bench; 25. metal bench; 26. foundry box; 27. bar folder and brake; 28. metal lathe; 29. power hack saw; 30. grinder; 31. anvils; 32. gas furnace; 33. gas forge

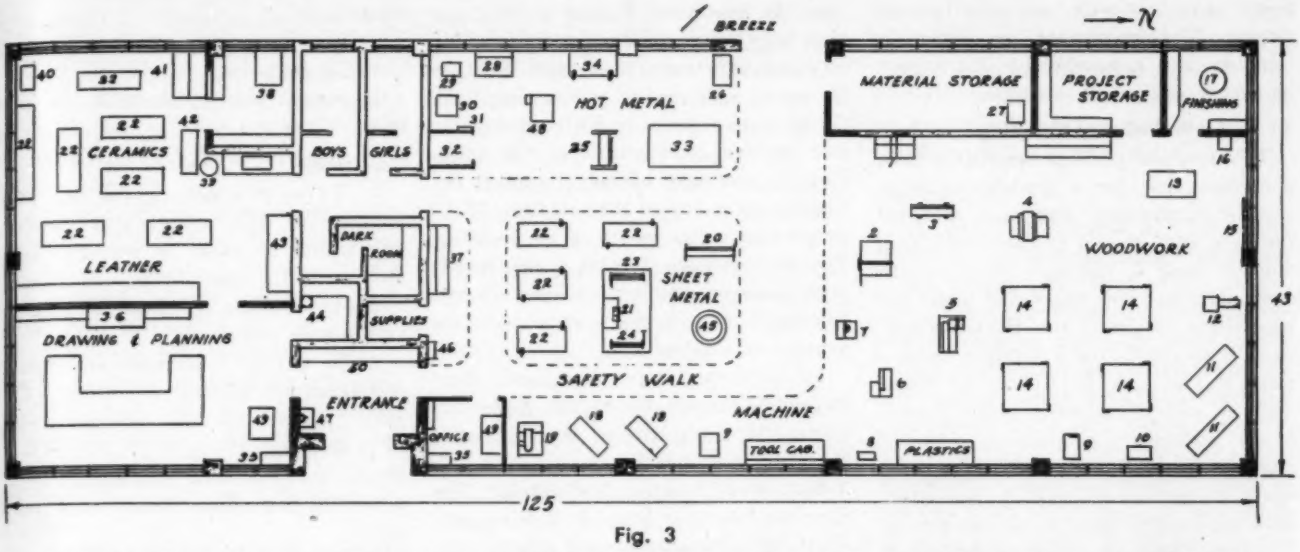

Fig. 3

1. Cut-off saw; 2. table saw; 3. jointer; 4. planer; 5. belt-disk sander; 6. band saw; 7. wood shaper; 8. buffer; 9. drill press; 10. grinder; 11. wood lathe; 12. scroll saw; 13. glue table; 14. four place workbench; 15. clamp rack; 16. sink; 17. paint table; 18. metal lathe; 19. metal shaper; 20. brake; 21. rotary machines; 22. workbench; 23. bar folder; 24. slip roll; 25. shear; 26. power hack saw; 27. air compressor; 28. foundry box; 29. furnace; 30. forge; 31. arc welding; 32. welding booth; 33. layout bench; 34. workbench; 35. file cabinet; 36. drawing storage; 37. tool panels; 38. kiln; 39. potter's wheel; 40. plaster wheel; 41. glaze storage; 42. clay storage; 43. damp box; 44. hot water heater; 45. wash fountain; 46. power panel; 47. drinking fountain; 48. gas welding; 49. desk; 50. display

College of Texas was asked to assist in the planning of the laboratory.

To avoid some of the embarrassment resulting from not planning for the future as well as the establishment of a department which is not in keeping with present-day school philosophy, it is very essential that the planning group give some thought and time to the following important factors:

1. Analysis of the community for which the laboratory is being planned. *First* of all to determine the financial status of the school. *Secondly,* study the community activity and the industrial background, since the school shop should be adopted to fit the needs of the community. *Thirdly,* postschool activities — students' need for knowledge, some do not always continue to live where they go to school.

2. The objectives of general education should be carefully analyzed and the industrial-arts department planned and established accordingly.

3. Study and analyze the objectives of industrial arts.

4. Select activities — looking ahead to the future activities of the pupils and then provide for them.

To co-ordinate the thinking of the industrial-arts department at the A. & M. College of Texas with that of the Kingsville public school officials, several conferences were held with Mr. Evans. Through these conferences, answers to a few of the more important questions were obtained, such as:

1. Funds available
2. Types of subjects to be taught
3. Age or grade level of students
4. Expected enrollment
5. Possible future additions
6. Location of shop with reference to other rooms or building
7. Whether shop is to be a separate building or a wing of the main building
8. Type of tool storage
9. Orientation of the shop — direction to face
10. Auxiliary rooms desired
11. Type of illumination
12. Type of heating and ventilation
13. Type of floor desired
14. Toilet facilities needed
15. Type of electric power available
16. Display space desired
17. Safety precautions
18. Outside entrance, access for deliveries.

The foregoing is only a partial list of the

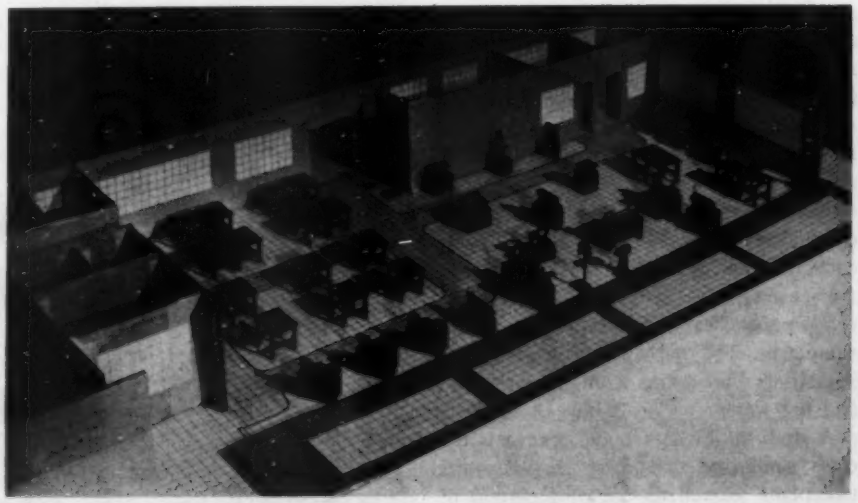

Fig. 2. Planning with scale models

many items that were and must be considered. The importance of making a complete and comprehensive list cannot be overemphasized at this time.

Preliminary Planning

This practical problem came at a most opportune time for a graduate class in schoolshop planning. The class accepted the task as a special problem, and each student made a thorough study of the community and the school and under the supervision of Dr. Chris H. Groneman, head of the Industrial Education Department at the A. & M. College of Texas, drew up several suggestive plans. Typical of the preliminary planning done by the students is the one shown in Figure 1, which was drawn up by C. J. Benshetler, who is now teaching industrial arts in Marlboro, Md.

Scale Models Expedite Planning

The second phase of the planning program was devoted to the utilization of scale models and the combining of ideas presented by each member of the class. Their accomplishment is shown in Figure 2. The scale models of machines as well as the simulated room illustrated in Figure 2 proved very valuable in visualizing the amount of space that is required by various pieces of equipment and the work area need. The template method, which was used in the preliminary planning, was of value in expediting equipment location, but it lacks the very desirable value of space visualization that is afforded by scale models.

Final Planning

The floor plan illustrated in Figure 3 shows the laboratory as it was actually constructed. Supplementary planning suggestions were offered by members of the industrial-arts department at the Texas A. & M. College in Kingsville, Tex. The building has concrete floors, tile backing up brick veneer walls, a flat steel deck roof, and steel windows. All electrical equipment is served with 3P/220V/60-cycle floor and wall outlets. Service outlets are spaced every 10 ft. along the wall and at workbenches for 110-volt portable equipment. The wash area consists of an industrial type wash fountain with cold and hot water.

A study of Figures 1 and 3 reveals the close similarity that exists between the two plans as well as the conservation of equipment and space by locating such areas as wood and plastics so that the tools may serve a dual purpose. This arrangement is true of other areas. Through the use of scale models, it was noted that the laboratory would be too congested for safe working conditions if all the activities planned were offered. To avoid the elimination of any of the activities, 15 ft. were added to the length of the building. This decision made possible a very appropriate program, and a much more efficient laboratory was obtained at a negligible increase in building cost.

At the present time all students from the eighth through the twelfth grades are taking the basic comprehensive general shop activities which consists of metal, leather, wood, ceramics, and drawing. The plans for next year are to include plastics, electricity, photography, and graphic arts.

Essential Building Features

The following criteria was found to be of extreme value to the students in their planning and should prove to be of equal value to others who are charged with the responsibility of planning an industrial-arts laboratory.

Place:

The following list suggests the order of preference of locating the place of the shop. This list does not consider the cost.

1. Entire separate building
2. Separate building attached to main
3. Wing of building

Floor Level:

1. First floor, one to three steps above or below grade level
2. Second floor, undesirable in most cases

Accessibility:

1. To rest of school: (*a*) one large main entrance or exit to principal corridor; (*b*) within 50 paces of adequate toilet units; (*c*) the centralization of all shop rooms on one floor; (*d*) adjacent to necessary storage rooms.
2. To outside: (*a*) outside double doors should open to driveway if possible; (*b*) a ramp should lead from outside doorway to driveway.

Orientation (direction to face):

1. Drawing rooms should have north light.
2. A corner room preferred or a bilateral room when depending upon natural lighting.
3. Windows grouped on one side if width of room is not over 24 ft. wide.

General Statements Regarding Facilities:

1. Tool cabinets should be centrally located in the middle of long wall.
2. Storage and supply rooms are usually placed where the space is not considered so valuable as that of classroom area.
3. First aid cabinet should be most conveniently located as regards washing, lighting, and resting facilities.
4. Lavatories, drinking fountains, and

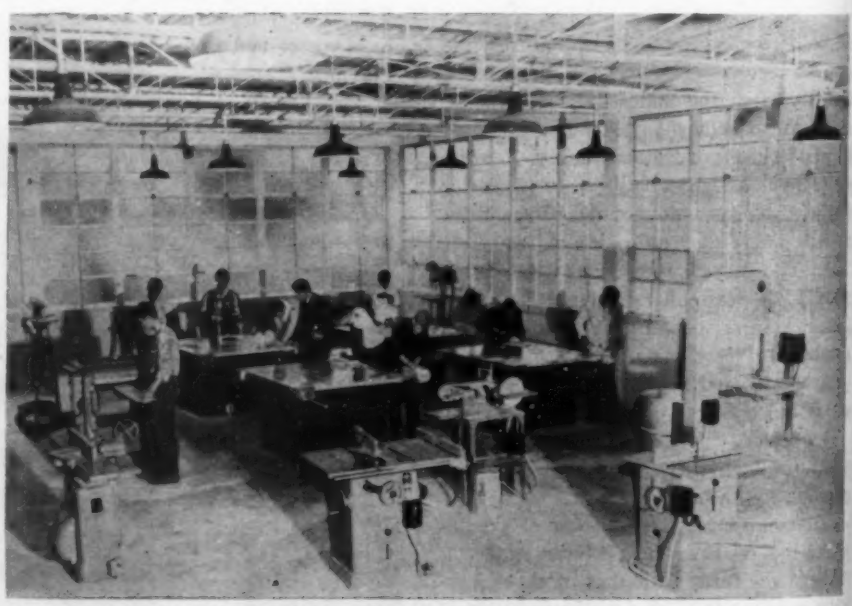

Fig. 4. View of woodworking area revealing equipment arrangement and efficient illumination

sinks should be found in the laboratory shop and should be visible.

5. If possible, a lecture-demonstration bench should be the form of a permanent installation and so located as not to have the pupils face the light.

Building Details:

1. Floors: (*a*) one of the most important parts of the shop; (*b*) solid wood floor desired, also wood blocks; (*c*) fire brick or earth for hot metal area; (*d*) cement floor for auto units.

2. Walls: (*a*) dull-glazed brick up 5 ft. from floor makes a good wall for laboratory shop; (*b*) upper walls and ceilings should be plastered with an acoustical or soft plaster.

Size and Shape of the Laboratory of Industries:

1. For an enrollment of 12 to 24 pupils about 1800 to 2400 sq. ft. would be an adequate floor area.

2. The rectangular shape shop is most desirable with a ratio of 1:2 as regard width to length.

3. The width of the room should be determined by the height of the windows from the floor.

4. A shop with a 12-ft. ceiling should not be over 24 ft. wide, if lighted from one side.

5. For the ordinary general shop 75 sq. ft. per pupil gives a very satisfactory floor space.

6. Open floor space for assembly space.

Height of Shop:

1. Ceiling heights of 12 to 15 ft. are most desirable for the laboratory shop.

Auxiliary Facilities of the Laboratory Shop:

1. "An auxiliary facility is a necessary adjunct to the efficient operation of a laboratory shop, but not so important a phase of its operation as to be considered on a par with the various shop units."

2. The shop auxiliaries may be one or more of the following: (1) instructor's office, (2) planning center, (3) supplies, (4) project storage, (5) lockers, (6) lavatory, (7) demonstration space, (8) finishing room, (9) display shelves or space.

3. Balconies: (*a*) Where floor space is limited, a balcony placed 6 ft. 6 in. from the ceiling provides working or storage space. (*b*) The balcony should not be located to interfere with the daylight.

4. Vents, flues: (*a*) All kilns, forges, furnaces, automobile exhausts should be connected to flues. (*b*) Building laws supply data regarding the use of flues.

5. Window placement: (*a*) Upper part of window is much more effective. (*b*) Windows with narrow mullions should be selected. (c) Glass area ratio to floor space should be 1:4.

6. Shades–Venetian blinds are best: (*a*) Shades should be very translucent and of color that harmonizes with room finish. (*b*) Fastened so as to protect from sun without shutting off light unnecessarily, movable or double mounted with one curtain at top of window and one at center of window.

7. Walls and ceiling: (*a*) Walls and ceiling should be light in color. (*b*) Ordinary plaster walls or painted brick walls commonly accepted. (*c*) Height of ceiling should be at least 12 ft.

8. Partitions: (*a*) Upper part of partitions between laboratory and auxiliary rooms should be transparent and soundproof as possible. (*b*) May be made from glass, tile brick, wood, depending upon individual situation.

9. Doors, entrance and interior: (*a*) All doors should swing out. (*b*) Use only one large entrance to laboratory. (*c*) Master key all locks to doors of laboratory. (*d*) Avoid use of laboratory as passage to other rooms.

10. Blackboard and bulletin boards: (*a*) Blackboards and bulletin boards should face the light. (*b*) Slate blackboard recommended. (*c*) Minimum of about 10 linear ft. per laboratory. (*d*) Blackboard should be at least 3 ft. 6 in. wide. (*e*) Minimum size of bulletin board, 24 sq. ft. (*f*) Bulletin board should be placed at same height as blackboard.

11. Plumbing: (*a*) Every laboratory should possess a drinking fountain. (*b*) One washing facility should be provided for every eight pupils. (*c*) Gas, if available, outlets of various sizes to fit equipment: (1) bench outlets ½ in. (2) forges and furnaces 1 in.

12. Lighting and power: (*a*) separation of light and power switches; (*b*) one primary power switch controlling all equipment; (*c*) individual switch for each primary machine located in power panel; (*d*) voltage and phase of current; (*e*) future needs; (*f*) The light at bench height all over the laboratory should be 25 to 30 F.C.; (*g*) The light on the working area in the drawing, printing, and planning room or area should be approximately 45 to 50 F.C.; (*h*) An article by William G. Darley, "Seeing in the Schoolhouses," appearing in the March, 1946, and April, 1946, issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine, should be studied and analyzed for assistance in providing illumination in the school shop.

Color Scheme

An article by Joseph C. Thompson, "Color in the School Shop," appearing in the March, 1947, issue of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine, was of value. Also, color combinations as advertised and recommended by various paint companies in their bulletins have proved to be very reliable.

Metal storage space for short stock, vertical bar stock, and sheet metal

WE ARE SORRY

We have been informed that several errors have appeared in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION within the past few months.

In the January, 1951, issue, on page 17, the cost of the Standard Vari-Typer is given as $8.50. This should have been $850.

In the February, 1951, issue on page 20A and again on page 25A, the word Negro has been lower cased.

It is unfortunate that these errors were overlooked and it is hoped no one will entertain the idea that any motive of discrimination was involved.

According to our house style that word should be capitalized at all times.

Plastics Unit Shop

The planning, equipping, and organizing of a senior high school industrial-arts plastics fabricating shop

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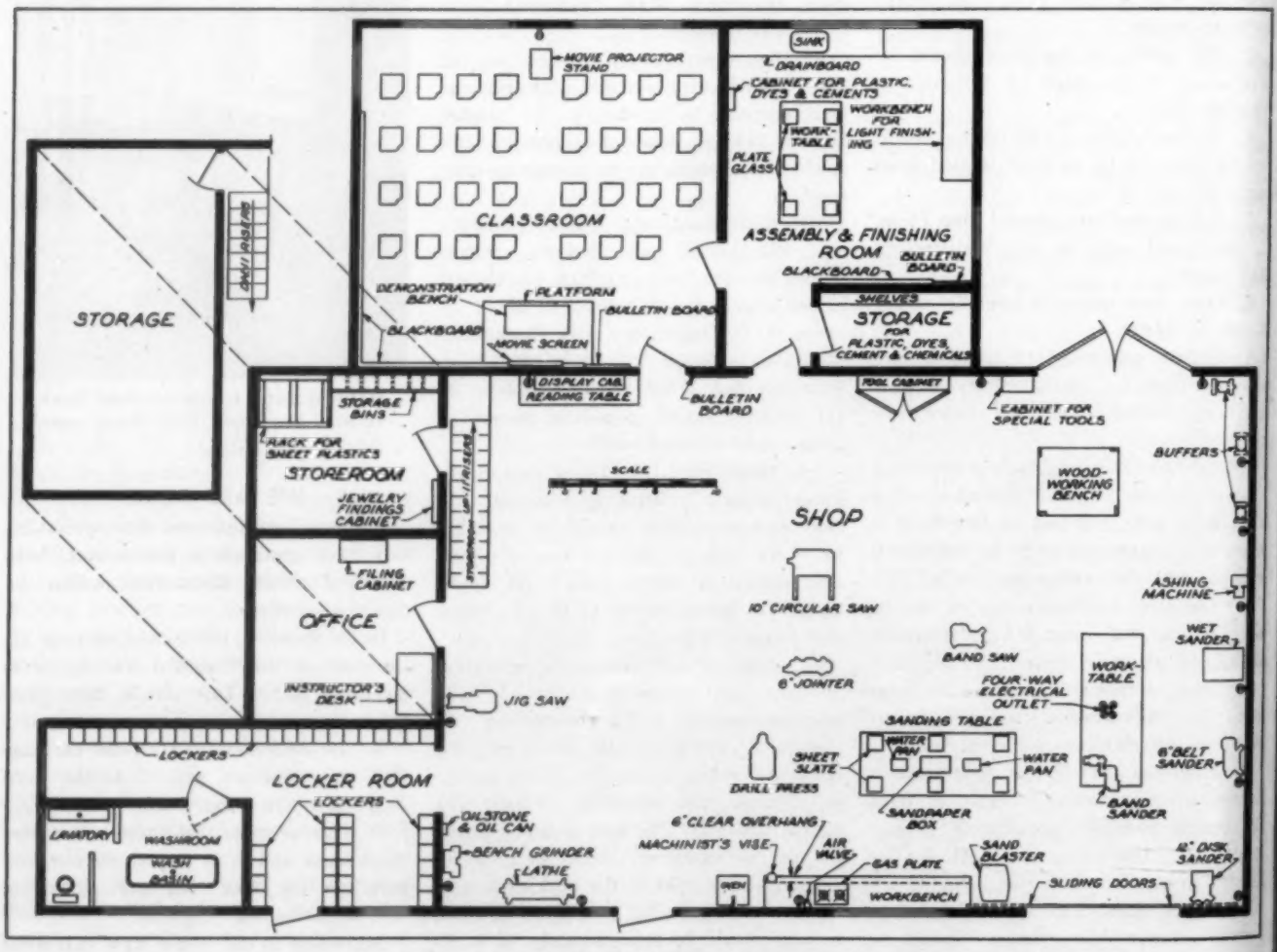
In keeping abreast of modern trends in industrial-arts education the teacher in this field is often confronted with the problem of planning, equipping, and organizing of a shop in one of the newer subjects.

The teacher facing such a problem may discover early that a dearth of material exists in the particular subject field in which he must work. Such is the problem usually experienced by those who might be called upon to establish a unit shop in plastics. Through extensive reading and studying in the field of plastics, combined with vocational plastics training, experimentation, and industrial arts and vocational teaching experience, the shop described herein has been planned and established to provide appropriate work to eleventh- and twelfth-grade boys and girls of the senior high school.

As is often the case, the building available for the establishing of a plastics course was planned and built long before the advent of plastics into the high school industrial-arts program. However, by careful survey and planning a shop has been established which is proving to be a very efficient teaching and learning laboratory. Observation of the floor plan will indicate



Plastics shop of Salinas Union High School

definite establishment of equipment, and use of all rooms comprising the shop. To provide maximum efficiency in teaching and learning conditions in a building already available a plan was used to eliminate crowded conditions and provide ultimate safety for a class of twenty students, by arranging all machines throughout the shop; keeping in mind the progress of material from raw stock to finished project.

Storeroom

Beginning with the storeroom, located adjacent to the shop office, the raw plastic material is routed from this storeroom to the circular saw, jointer, and band saw for cutting to size. The storeroom is equipped with a rack for storing various thicknesses and colors of standard 3 by 4-ft. sheets of acrylic plastics. Also located in the storeroom are a sufficient number of rows of storage bins large enough to accommodate standard sizes of phenolic novelty rod stock (dogs, birds, elephants, donkeys, rabbits, fish, rings, bracelets, hearts, etc.) as well as a variety of colors and thicknesses of phenolic and acetate sheet stock. A number of these bins serve as storage for materials cut to rough sizes for beginning projects. All storage spaces are labeled and indexed according to their use to facilitate rapid handling of materials, and ease in taking inventory. The storeroom is cool and well ventilated — a requirement necessary for proper storage of plastics, especially the paper masked acrylics. Chemicals of all kinds are kept from this room as most chemicals have a tendency to craze some plastics, leaving minute fractures, which renders the material unattractive and useless.

Shop

In close proximity to the band saw is a worktable where patterns may be used in transferring designs to the plastic material for band-sawing to shape. This worktable also contains a four-way 110 volt electrical outlet where the small motor driven and vibrating type machines and tools may be used safely without damage to them; for while using them here there are no extension cords to trip over. One end of the table supports a small band sander which is used mainly in sanding the delicate and dainty parts found in plastic jewelry. The motor driving this sander is equipped with a double shaft. One end of the shaft carries a chuck for holding small sanding, buffing, and polishing spindles for finishing the small and delicate pieces after sanding on the band sander. In a near by corner of the shop is located a 12-in. disk sander, which makes use of the coarser abrasive papers, for rapid sanding of plastics to a pattern line without burning the material due to frictional heat. A 6-in. belt sander is located in this area employing fine abrasive belts which are used to sand fine pattern lines with a reasonably smooth sanded surface resulting; requiring little hand sanding or buffing for a finished surface.

After dry sanding has been completed the plastic is taken to a special sanding table, where the wet-or-dry type of abrasives of various grits are used by hand to get as smooth a surface as possible. Upon this table are placed two shallow pans of water for wetting the wet-or-dry abrasive papers, and also a box in which to keep the abrasive materials. Six pieces of discarded blackboard slate are used as a flat surface to "back up" the abrasive paper when hand sanding straight and accurate edges, such as the edges of a plastic box. All pieces of slate are securely fastened to the table by wooden frames; and holders for the water pans and box are also provided. Such a sanding table affords a working place which is easily kept neat and clean with a minimum of time and effort expended. The table top has a clear lacquered finish waterproofing it, and giving it an appearance which encourages the students to take pride in keeping neat and orderly a work station, which might otherwise become a problem in the shop.

After completion of hand sanding, the plastic parts are taken to the buffing machines where they are buffed by a cotton muslin wheel using buffing compound; and polished on a dry cotton flannel wheel located on the opposite end of the through shaft of the machines. Hand sanding can be eliminated on many of the larger plastic parts by making use of the two belt wet sander. One coarse and one fine waterproof abrasive belt of the aluminum oxide type is used on this machine. Water constantly playing upon the belts, while in use, prevents the plastic from being damaged due to frictional heat; and results in a well-finished surface requiring but little buffing for a perfect appearance.

The ashing machine; a cotton wheel upon which wet powdered pumice is used, eliminates much hand sanding on irregular shaped plastic surfaces.

A woodworking bench equipped with vises stands just a few steps from a large tool cabinet, which contains all of the necessary hand tools for building the jigs and fixtures used in heat forming the thermoplastics into the various projects. Also near-by is the special tool cabinet containing the tools more applicable to plastics fabricating. Located between two doorways, is a glass enclosed bulletin board used for displaying plastics samples and related information.

Next, in order of appearance on the floor plan, is the sample display case mounted on the wall; and adjacent to it the reading and reference table, provided with chairs, where students may comfortably browse through the many books and magazines stored here on a magazine rack mounted on the wall above the table.

The shop office containing instructor's desk, filing cabinet, and many wall charts and visual aids is centered in one end of the shop. An unobstructed view of the entire floor of the main shop, containing all hazardous equipment, is provided by window and door openings at the front of the office.

The jig saw is situated in an open area where students may accomplish fine cutting without interruption. Bench grinder and oilstone are located adjacent to the lathe to facilitate tool sharpening. A 2800 watt electric oven adequately supplies the needs of those members of the class who are heat forming their plastics. Mounted on a corner of the bench next to the oven is a machinist's vise used in forming small plastic laminations; and for holding certain small jigs and fixtures used in forming the heated plastics. On this long wall type bench, provided with a 6-in. clear overhang, jigs and fixtures may easily be clamped for use. A small two burner gas hot plate is used for freehand forming of plastics. It also serves as a source of heat in heat sealing of plastics, as well as in hot water dyeing. Along the front of this bench a row of hooks provides storage space for many forming jigs and fixtures used in the work. An air valve with gauge, located on the wall above the bench, provides a source of compressed air for the blowing of plastic projects. The drill press near by serves as an arbor press upon which many intricate jigs and fixtures are mounted for heat forming the plastics. This machine is also used for all machine operations which can be performed upon it.

The sand blaster, at the end of the bench, is a machine which accomplishes the

many beautiful surface enrichment affects, enhancing the plastic projects. Metal stools are provided in the shop to facilitate work of a tedious nature.

In conjunction to the main shop is a classroom where all students meet at the beginning of their class. Within this room is located a demonstration bench, mounted upon a platform, where students may observe demonstrations of many phases of their work. All fundamental tools and materials, as well as a small portable electric oven, are located below the bench in a locked cabinet to facilitate giving the class demonstrations accurately without loss of time. Moving picture and slide equipment are available for showing the many films and visual aids now available in the field of plastics. Also in this room related information — science, mathematics, and drawing are carried on with students being tested upon all phases of their work. A bulletin board provides space for current newspaper and magazine articles relating to plastics.

Assembly and Finishing Room

The assembly and finishing room, followed after the pattern of industry, provides a room clean and free from dust for assembling and finishing the plastics projects. A worktable upon which 12-in. squares of plate glass are permanently mounted affords a means for securing the clear "soak type" joints which are so necessary in the acrylic plastic projects. Metal stools upon which to sit while accomplishing this intricate and exacting work are provided. A sink, for chemical dyeing of the plastics, is located within this room; and a workbench provides space for using colored laminating cements as well as surface enriching materials now available for use on plastics. This workbench affords space necessary for jobs where colored materials, such as, dyes and colored cements are used, leaving the large worktable with its plate glass pieces absolutely clean for obtaining the crystal clear joints in the cementing of acrylic plastics. A small wall cabinet contains the many chemical dyes, cements, and finishes; which are purchased in bulk and then placed in small containers for student use. A blackboard and bulletin board provide space for information and illustrations relating to the work performed in this room.

Chemical Storage

In a corner of the assembly and finishing room is located a small storage room containing the numerous dyes, cements, finishes, and other chemicals used in plastics fabricating. Since this room contains large amounts of highly flammable materials it is kept clean and well ventilated.

Locker Room

The locker room is the last room comprising the floor plan of the unit plastics shop. Here a sufficient number of individual student lockers are provided for students to keep their projects.

As shown by the floor plan, a large upstairs storeroom located above the office and a downstairs storeroom provides ample space for all large or bulky materials.

Installation of Machinery and Equipment

As noted by the plan of the plastics shop, all locations of machinery and equipment were based on safety first philosophy. Machines are bolted to the floor and yellow colored caution lines painted on the floor around each machine provide safety zones for the operator. All machines, with exception of the small vibrating and motor driven hand tools, are supplied with a 220 volt source of power allowing for greater efficiency. Although a main switch panel is provided for the entire shop, each individual machine is equipped with a short extension cord and outlet box. All operators of machines disconnect the extension cord from the outlet box when adjusting machines or changing cutters. This system insures ultimate safety for the operator of each particular machine without the necessity of turning the power off at the main switch panel, which in cases where more than one machine is wired in a given circuit, would interrupt others at work on machines. All machines are located so that no high speed cutter would be in alignment with other operators in the shop.

Adequate lighting is provided in the entire shop by use of windows and skylights. A system of individual machine and bench lighting with room lighting provides proper illumination when needed. Heat is furnished by overhead motor driven fan type air circulating heaters burning gas.

Hand Tools in the Plastic Unit Shop

Listed below are the hand tools now in use in the plastics shop described in this article. After each tool is listed the number of that particular item found to be adequate for a class of (20) students working on from three to four different fundamental projects simultaneously.

Layout tools:

- 24" steel scales (2)
- 12" steel scales (6)
- 24" framing square (1)
- 12" combination square with centering head (1)
- 6" spring divider (1)
- 8" spring divider (1)
- 6" compasses (2)
- Marking gauges with spur point (2)
- Irregular curves (set of 3)
- 6" try and miter squares (4)
- 8" try squares (2)
- 8" T bevels (2)
- ¼" dia. pocket scribes (6)
- ¼" x 3½" scratch awls (2)
- ⅜" x 4½" prick punches (6)
- Soft face hammer (1)

Hand shaping tools:

- Block plane (1)
- Needle files (2 sets)
- Twist drills (1 set 1/16" to ½" & 1 set Nos. 1 to 60)
- Jeweler's drills (1 set Nos. 61 to 80)
- Engraving tools (1 set)
- Carving tools (1 set of 6)
- Hand drill, ¼" capacity (1)
- Pin vise (1)
- 10" single cut, smooth flat files (6)
- 10" double cut, second cut files (6)
- 6" single cut, smooth, flat files (6)
- 6" single cut, smooth, half round files (6)
- 6" smooth, round files (6)
- Wood file handles to fit above files (3 dozen)
- Thread cutting tools (taps & dies — one each):
- ¼"–16 plug tap
- ¼"–16 die
- ½"–20 plug tap
- ½"–20 die
- ⅜"–24 plug tap
- ⅜"–24 die
- ⅛" pipe tap
- ⅛" pipe die
- 5/16"–18 plug tap
- 5/16"–18 die
- ¼"–20 plug tap
- ¼"–20 die
- 3/16"–32 plug tap
- 3/16"–32 die
- 8–32 plug tap
- 8–32 die
- 6–32 plug tap
- 6–32 bottoming tap
- 6–32 die
- Die holder (1)
- Tap wrench (1)

Hand cutting tools:

- Hack saw, 32 points (1)
- Coping saws (3)
- Jeweler's saws (3)
- Backsaw, 14 points (1)

Miscellaneous hand tools:

- Brace, 10" sweep (1)
- Solid center auger bits (1 each of Nos. 4, 5, 6, 8, 12 & 16)
- 13 oz. claw hammer (1)
- 7 oz. claw hammer (1)
- 8 oz. ball-peen hammer (1)
- 4 oz. ball-peen hammer (1)
- 6" C Clamps (6)
- Slip stone, round edge, medium (1)
- Oilstone, 6" x 2" x 1" (1)
- Hard Arkansas carving tool slips (1 set)
- Center punch (1)
- Nail set (1)
- File cards (3)
- 8" tin snips, 2" cut

(1)
10 oz. raw hide mallet (1)
7" smoothing plane (1)
14" jack plane (1)
Electrician's screw driver (1)
3" screw driver (1)
Bench vises, continuous screw type (2)
Machinist's vise, 4" jaws (1)
"I-Bar" clamps, 2 ft. (6)
Hand screws, No. 0 (4)
Hand screws, No. 2 (2)
3" C Clamps (12)
6" combination pliers (1)
5½" long needle nose pliers (1)
5" diagonal cutting pliers (1)
26" ripsaw, 6 point (1)
26" crosscut saw, 11 point (1)
8" adjustable wrench (1)
½" countersink (1)
8" scissors (1)
Bench brushes (4)
Allen wrenches (1 set)
Oilers (2)

Machine Tools in the Plastic Unit Shop

Listed below are the machines, equipment, and supplies which are adequately serving the needs of classes of (20) students each in the plastics shop.

A. Circular saw, 10 in.

1. Ripping fence
2. Miter gauge
3. Box end wrench — for changing saws
4. 10" circular saw, hollow ground, 5 to 8 teeth per inch. Cuts 1/16" saw kerf. (Must have negative rake.)
5. 10" circular saw, hollow ground, 5 to 8 teeth per inch. Cuts 1/8" saw kerf. (Must have negative rake.)
6. Carborundum "cutoff" wheels, 3/32" thick, 8" dia.

B. Band saw, 14 in.

1. Ripping fence
2. Miter gauge
3. Saws: 1/4", 3/8" & 1/2" wide, 26 or 28 gauge, 14 to 15 teeth per inch, wavy set

C. Jig saw, 24 in.

1. Machine files
2. Blades: Nos. 3, 4 & 5 Jeweler's, 6" long

D. Jointer, 6 in.

1. Set of knives
2. Wrench for changing knives

E. Wood lathe, 12 in.

1. ½" round nose tool
2. Parting tool
3. ½" skew chisel
4. ¼" round nose tool
5. ¼" skew chisel
6. 1" skew chisel
7. ¼" carbide tipped square nose turning chisel for turning plastics
8. ⅛" carbide tipped round nose turning chisel for turning plastics
9. Jacob's chuck to fit head and tail stocks
10. 3" face plate
11. 6" face plate
12. 6" inside calipers
13. 6" outside calipers
14. Universal 3-jaw chuck with back plate
15. Plastic face shield

F. Disk sander, 12 in.

1. Miter gauge
2. 12" sanding disks, garnet 1½ grit
3. Distic stick cement

G. Belt sander, 6 in.

1. Miter gauge
2. Aluminum oxide belts, ½ grit

H. Band sander, 1 x 42" belt

1. Back stops
2. Aluminum oxide belts, ½ grit

I. Wet sander, double belt horizontal type, 4 x 82" belts

1. Waterproof belts, 80 grit
2. Waterproof belts, 150 grit

J. Buffing and polishing heads, 8 in.

1. Three ⅓ h.p., repulsion-induction type motors, 1750 r.p.m., 220 volt with double overhanging shafts ½" dia.
2. Six work arbors for above motors — 2⅜" spindle for ½" diameter shaft. 20-thread. Over-all length 4".
3. Three 8" dia. x 1" face, ½" arbor hole, sewed muslin buffing wheels.*
4. Three 8" dia. x 1" face, ½" arbor hole, loose flannel polishing wheels.*
5. Buffing wheel rake. (A short wooden handle with nail points protruding out of one end. Used for "breaking down" a caked buffing wheel.)
6. Buffing compound

K. Ashing wheel, 6 in.

1. ¼" h.p., 1750 r.p.m. motor with ½" shaft.
2. Work arbor 2⅜" spindle for ½" shaft dia. 20-thread. Over-all length 4".
3. Splash hood
4. Pendabrade (a superior abrasive for ashing operations).
5. "Mud" paddle (used to apply abrasive to the ashing wheel).
6. Wheel (use discarded muslin buffing wheels from the buffing machines and build up ashing wheel by alternate 4-in. and 6-in. layers to proper thickness for work to be accomplished).

L. Drill press, 11 in.

1. Set of machine spur bits (1/4", 5/16", 3/8", 1/2", 5/8" & 3/4")
2. 1½" sanding drum
3. 2" sanding drum
4. 2½" sanding drum
5. Oiler (for liquid soap)
6. Machine countersink, ½" dia. shank, 60 degree
7. Drill vise, 3" jaws

*It has been found most convenient to use a sewed muslin buffing wheel on the left shaft of each motor upon which to apply the buffing compound for buffing; and a loose flannel polishing wheel on the right shaft to be used dry for polishing.

M. Grinder, bench type

1. Grinding wheel dresser

N. Rotary tool

1. Set of accessories
2. 1/16", 3/32" & 1/8" dia. tapered drills for internal carving
3. Assorted sizes and shapes of dental burrs for external carving
4. Collets to fit above drills and burrs
5. Plastic face shield

O. Vibro tool

1. Standard needles for engraving
2. Abrasive points for frosting plastic

P. Sand blaster, 2 x 2 x 3-ft. cage equipped with sleeves and gloves, plastic window and light

1. Number LA7 abrasive gun
2. Extra nozzle tips
3. 100 lb. sand blasting abrasive
4. Masking tape and paper
5. Rubber cement

Q. Gas plate, 2 burner table model

1. Flint lighter

R. Oven, 220 volt, single phase, 2800 watt

1. Sheet asbestos for shelf coverings
2. 12 pairs cotton jersey gloves — assorted sizes

S. Strip heater

T. Laminating, heat sealing and forming press

1. Set of spacers
2. Wrench

U. Equipment for dyeing plastics

1. Enameled pans
2. Enameled funnel, 5" dia.
3. Two straight tweezers, 6"
4. Rubber gloves
5. Eye droppers
6. Glass containers for storing aqua dye after mixing (1 gal. size)

V. Equipment for cementing plastics

1. Shallow enamel pans
2. Plate glass
3. Cementing tapes
4. Hypodermic needles
5. Acid type brush, 3/8" wide, 6" long
6. Water color type brush, small fine tip

Supplies

Abrasives:

No. 3/0 wet-or-dry garnet finishing paper
No. 5/0 wet-or-dry garnet finishing paper
No. 7/0 wet-or-dry garnet finishing paper
No. 220 speed wet Silicon Carbide finishing paper
No. 320 speed wet Silicon Carbide finishing paper
No. 400 speed wet Silicon Carbide finishing paper
No. 3/0 steel wool
Rubbing compound (type used on automobile and high grade furniture surfaces)
Triple *X* plastic buffing compound

Learok Grade No. 888 — Tripoli Grade No. 154
Learok Grade No. 304

Washing supplies:
Kerosene — Liquid soap

Hand cleaners and polishes:
Franklin's cleaner for acrylic plastics — Franklin's burnisher for acrylic plastics

Waxes:
Franklin's Plexiglas Wax — Johnson's Industrial Wax No. 102-C
Simoniz wax — Duco No. 7 Wax

Polishing cloths:
Imitation chamois No. 709 — Cotton flannel

Dyes:
Standard chemical dip dyes — variety of colors — Internal Carving Dye — variety of colors
Internal Dye Thinner
Aqua plastic dyes — variety of colors

Cements (for plastics):
Methylene Dichloride — Laminating — variety of colors
Ethylene Dichloride
1 A cement with accelerator
Acetone
General purpose cement (for bonding plastics to leather, wood, glass or metal)

Glues (for wood):
Grade A Casein — Woodlok
Weldwood

Materials for surface enrichment:
Cryst-L-Craze — variety of colors
Silk screen paints for plastics
Decalcomanias
Monogram filler

Fastening devices:
A. Machine screws
6–32 x ¾" flat head
6–32 x ¾" round head
6–32 x ¾" oval head
8–32 x 1" flat head
8–32 x 1" round head
B. Drive screws
No. 2/0 x ⅛" round head
No. 2/0 x 5/16" round head
No. 2/0 x ¼" round head
No. 6 x ⅜" flat head
C. Self-tapping screws
No. 2 x ⅜" flat head
No. 4 x ⅜" flat head
D. Plastic screws
6–32 x ½" oval head

Findings (metal & plastic):
¾" plastic pin backs
1" plastic pin backs
1" metal prong type pin backs
Necktie clasps
Plastic button shanks
Cameos, plastic (assortment of types, colors & sizes)
Sterling silver necklace chains, 18" with spring ring clasps
Earring mountings (metal screw type & plastic slip-on type)
2" barrette pins
Jump rings (assorted sizes of oval & round, white finish)
Pendant rings — Dress clips
Pen mounts — Buckle catches
Pen funnels — Hinges

Accessories:
Tapered fountain pens — Key chains
Midget cigarette lighters — Test tubes, ¾" dia. x 6" long
Binder posts — Glass shell type vials, 1 & 3 dram

Lamp parts:
8" brass plated harp — 6-ft. cord with plug
1½" brass finial — Lamp shades (assorted shapes, sizes & colors)
Brass plated pipe, ⅛ size
Hexagon nut, ⅛
Standard push through socket

Miscellaneous supplies and equipment:
Plastic marking pencils — black and yellow
Plaster of Paris for filling cavities of internal carving
(12) metal stools, 14" dia., 22" high
Sheet fiber, 1/16" thickness for permanent patterns
Mucilage for fastening paper patterns to plastics
Dowels — ¼", ⅜", ½", ¾" and 1" for jigs & fixtures
No. 17 wire brads for joining plastics
Art enamel brushes, ½" wide for applying laminating cements & Cryst-L-Craze
Fir plywood, ½" and ¾"–5 ply G1S for jigs & fixtures
Various thicknesses of random widths and lengths of soft wood for making forms

Plastic Materials

The following list of plastics materials has been found adequate for making a great variety of attractive and usable projects at moderate costs.

A. Plexiglas and Lucite[1] clear transparent sheets
(36" x 48" standard size)
Thickness: 1/16", 1/10", ⅛", 3/16", ¼", 5/16", ⅜"
B. Colored Plexiglas and Lucite
(36" x 48" standard sizes[2])
Thickness and color:
1/16" white translucent — 3/16" green transparent
⅛" red transparent — ⅛" red daylight fluorescent
3/16" red transparent
5/16" red translucent — ⅛" yellow daylight fluorescent
3/16" medium blue transparent

C. Plexiglas and Lucite rods (48" long)
Diameters: 1/16", ⅛", 3/16", ¼", 5/16", ⅜", ½"

D. Lucite cast tubing (⅛" wall thickness, 12" long)
Diameters: 3½", 4", 6"

E. Plexiglas and Lucite Internal Carving Blocks (or Blanks)

½ x 1 x 1"	¾ x 1 x 1"	1 x 1 x 1"
½ x 1 x 2"	¾ x 1 x 2"	1 x 1 x 2"
½ x 2 x 2"	¾ x 2 x 2"	1 x 2 x 2"

F. Plexiglas and Lucite Clear Polished Balls
Diameters: ½", 5/8", ¾", ⅞"

A. Cast Resinoids[3] (12 x 24" standard size sheets, variety of translucent, opaque and mottled materials in many colors)
Thickness: ⅛", 3/16", ¼", ⅜", ½"

B. Round rods (standard molds)
Diameters: 1", 1¼", 1½"

C. Square rods
Sizes: 1", 1¼", 1½"

D. Cylinders

1" O.D. x ½" I.D.	2" O.D. x 1½" I.D.
1⅜" O.D. x ½" I.D.	3" O.D. x 2⅝" I.D.

E. Special castings

Ring tube (assorted sizes & colors)	Buckle
	Bracelet
Scotty dog	Cross
Elephant	Heart
Donkey	Window shade pulls
Dachshund	Napkin holders (bunny, rooster, scotty dog, elephant & fish)
Duck	
Anchor	
Butterfly	

F. Acetate sheet stock
(20 x 50" standard sizes)
Thickness:
.010 (for heat sealing) — .040 (for leaves, flowers; etc.)

[1]Trade names for Rohm & Haas Co., and E. I. Dupont Co. products, respectively.
[2]Discounts are given on the purchase of 150 sq. ft. or more.
[3]Marketed under the trade names of Amberol, Bakelite, Catlin, Garalin, Marblette, and Trafford.

Sanding plastics on the wet sanding machine

Some Thoughts Relative to Shop Planning

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Shop planning, in its broadest sense, may be considered as having to do with providing space for industrial-arts activity, or activities in available rooms or buildings, antequated shops, in new buildings that have been completed but not equipped, and in proposed buildings being planned or about to be built.

Where a room is found available for industrial arts in a school building and it is desired to make the best possible use of it, problems arise as to how the facilities available can be used to the best advantage in providing for the desired activities. Consideration must be given to possible improvements, the installation of plumbing, gas, electric outlets, and the like if any of these are not available but may be provided. Careful thought must be given also to the arrangement of workbenches and equipment most desirable to meet the needs as nearly as possible to not only justify the use of the room for industrial-arts purposes but to make the work so valuable as to justify more space, or perhaps a complete shop, as soon as possible. Many good industrial-arts departments have been developed after a modest beginning in space available at the time work was desired. To make the best of such a situation is most essential planning on the part of the teacher or perhaps the administrator of the school.

In a great many cases, it is found that the shops provided for a program of work thought to be industrial arts, or developed years ago when the real objectives of industrial arts were not understood, requires replanning to meet the present-day needs in a broad, modern industrial-arts program. These situations require careful analysis of the shops as they exist, the arrangement of the equipment as it is found, the methods of instruction used and other factors involved in presenting the work in the past. Then, on the basis of these analyses, the modifications can be planned and rearrangements can be brought about to accomplish the changes necessary to modernize the program of industrial-arts activities. To do a good job in a situation of this kind requires very careful planning if the work is to be done economically and well.

Sometimes, although this is not desirable, the shop planner finds that a building has been planned by an architect and built, or the shop rooms have been provided on the building plans, and the planning job consists of selecting the equipment for the shops and perhaps suggesting where outlets of various kinds should be placed, the kinds of floors most desired, locations of built-in cabinets, and perhaps some other details which may be included even though the walls of the building have been completed. Such a situation requires fast thinking and planning to make full use of the building for industrial-arts purposes in a modern curriculum and the educator called upon to do such planning must be able to work out plans to fit into the rooms provided by the architect. Sometimes in cases of this kind, prints of the building plans are available and can be modified in time to include desired details within the estimates of the contractor.

Perhaps, when a new school building is contemplated, the industrial-arts teacher or school shop administrator may be called in with the architect to make preliminary drawings before bids are taken or construction of any kind has been started. This is, of course, very desirable provided the teacher or the administrator has a good working knowledge of shop building and has a sound philosophy, and a practical one, so that he can work with the architect in suggesting desirable plans. However, a teacher who does not have practical ideas or who cannot present the architect with workable material may not be given too much consideration in determining the final details.

It would seem that regardless of the type of planning to be done; the utilization of an available room, the modification of an antequated shop, or the suggesting of plans for shops in a proposed or partially completed building, the teacher should be familiar with, or have practical information available on the following:

1. The generally accepted philosophy of industrial arts and vocational education with the distinction between the two.
2. The generally accepted objectives of industrial arts as a part of the school curriculum for all pupils.
3. The vast number of types of industrial-arts activity that should be considered with the whole school in mind.
4. Minimum tools, equipment, and supplies required for various types of industrial-arts activities.
5. Elements, or areas, of a shop or workroom possible to provide industrial-arts activities.
6. Typical shop-plan drawings illustrating possibilities.
7. All available reference material on shop planning.
8. Check lists on specifications as to building materials and construction details.
9. Satisfactory methods in use in the arranging of tools, equipment, and supplies and possible desirable modifications of them.
10. A practical knowledge of organization and method in teaching for most desirable results in terms of pupil or adult accomplishment with reasonable expenditure of time and money.

Industrial Arts at the State College of Washington

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and
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On February 17, 1950, over three thousand persons from almost every city and town in the Inland Empire visited the newly remodeled and enlarged industrial-arts laboratories at the State College of Washington. The open house told the story of progress in the field of industrial-arts education which is of great interest during the sixtieth year jubilee of the founding of the state college.

History

Industrial arts was introduced into the college curriculum in 1898. During the earlier years enrollments were low and the success of the department was rather doubtful. Since 1932 with Professor U. G. Whiffen in charge of the department, new courses were added and the industrial-arts program expanded considerably. Recent changes were not only in the physical layout of the laboratories, but also in the industrial-arts curriculum.

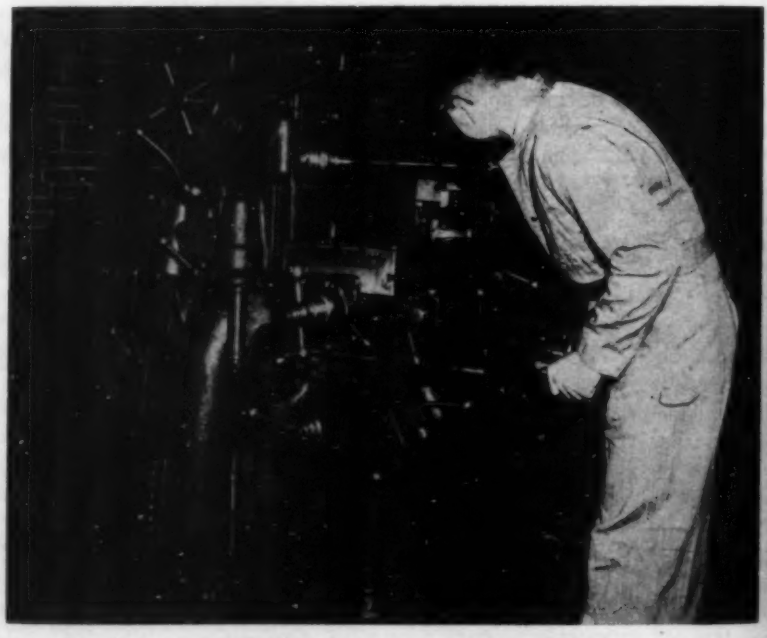
According to the Strayer Survey of Public Education in Washington, conducted in 1946, there will be a 50 per cent increase in the school population by 1960. This means that 200,000 more pupils will be going to school than there were in 1945. In the two year period 1945 to 1947, the school population has increased 7 per cent as contrasted with the 9.24 per cent in five years as reported by George Strayer. The increase in the number of students indicates that measures should be taken to provide adequate and qualified teachers on both the elementary and secondary level. According to this report it will be necessary to train more qualified industrial-arts teachers. Realizing this need on both the elementary and secondary levels, J. Murray Lee, dean of the School of Education and a specialist in elementary education conferred with U. G. Whiffen, and with excellent co-operation from the administration made plans to meet the changing demands. State appropriations for new college buildings plus the increase in the number of students majoring in industrial-arts education accelerated the expansion program of the department.

The construction of the Washington Institute of Technology building made possible the removal of the engineering research laboratories from the overcrowded industrial-arts building. The additional removal of certain other departments left the entire second floor of the industrial-arts building free for the exclusive use of the expanding industrial-arts program. This building is one of the college's older structures, which in earlier years of the institution housed the entire school of engineering, the foundry and the machine shops. These units now occupy several newer buildings.

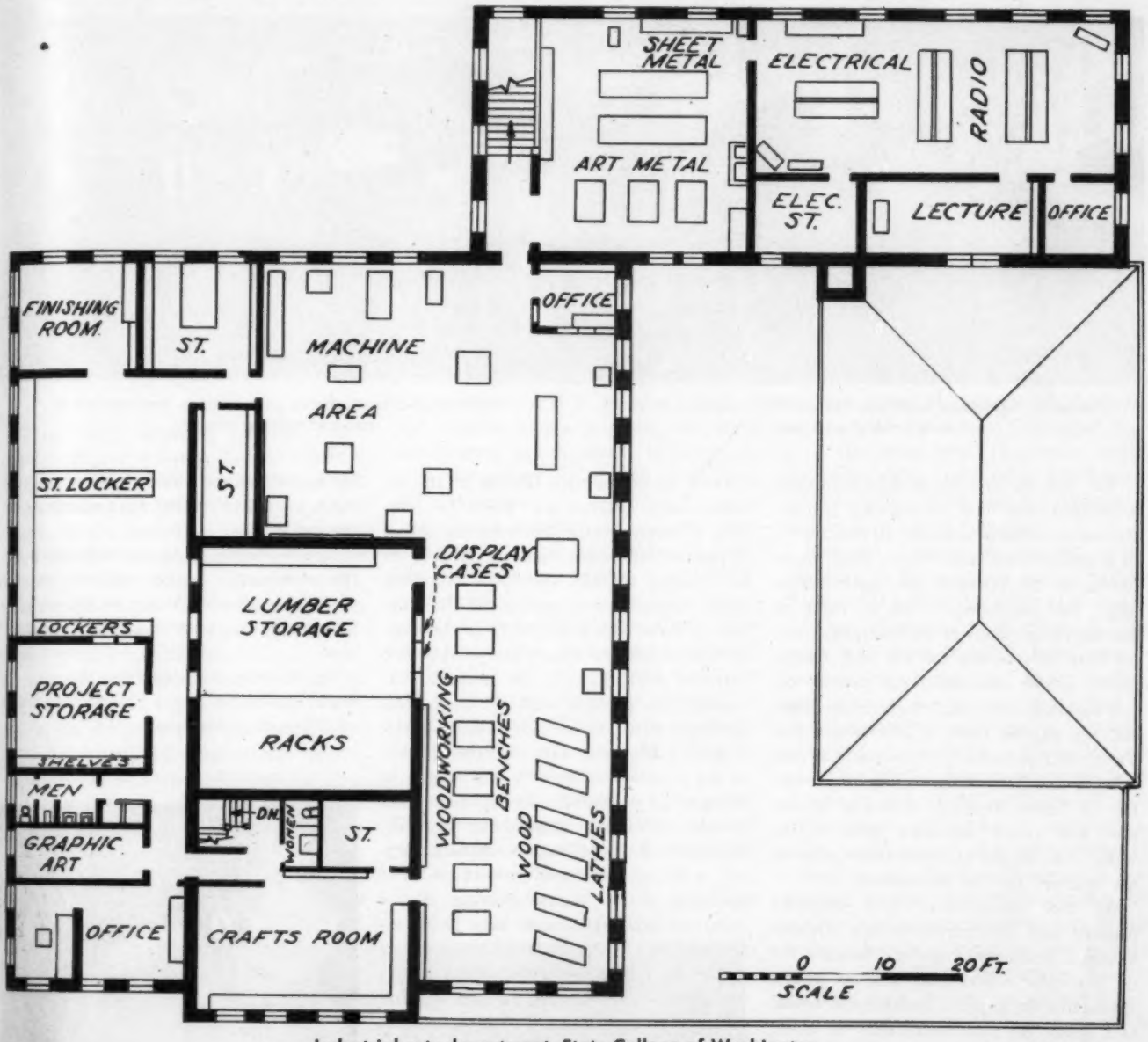
Physical Layout

The weather-beaten brick exterior of the industrial-arts building is no indication of the modern, pleasant, and colorful arrangement of the inside. This pleasant atmosphere is a far cry from the dark, gloomy rooms that housed the industrial-arts facilities several years ago.

Modernism prevails everywhere, from the psychological use of color which decorates the machinery down to the interdivisional communications and department wide public-address system, which speeds up the passing of all necessary information despite the constant noise of the machinery. The remodeling, considering its thoroughness, has been surprisingly inexpensive. Wide use of war surplus properties, plus the untiring efforts of the department members in doing the repainting and cabinetwork cut the remodeling costs considerably.



Men learn to run modern equipment, such as milling machines



Industrial-arts department, State College of Washington

Wood lathes and hand woodwork equipment

The annual industrial-arts exhibit

Modern, spacious laboratories enable students to work with safety and comfort

Industrial-arts students use modern equipment in cabinetmaking classes

The wide use of color in the laboratories is probably the most outstanding feature. Red safety islands surround all machinery, with special sand-based floors which make footing of the operator safe against slipping. The psychological use of color on machinery functions in the following manner: red is reserved for the true danger parts; yellow indicates hand wheels, adjusting knobs, etc.; tableways, table edges, etc., are painted ivory, a color which is a sharp contrast to most of the material that is being handled; while vista green is used for all bases. Receding colors of glacier blue and yellow dominate most of the walls. Tile red and a darker shade of green are reserved for the wainscoting.

All tool panels have been carefully planned and constructed — each division having a designated color and location for its particular tools. The brilliant yellow silhouettes on a green background reveal at a glance the tools which may be in use or may have been misplaced.

Curriculum Development

With the enlargement and development of the facilities in the industrial-arts laboratories, the department has broadened its course offerings to meet newer needs and trends in the field of industrial-arts education. The first and primary purpose of the department has been to train teachers of industrial arts in the elementary and secondary schools. Because of the shortage of competent teachers on the elementary level, courses have been developed that will aid in meeting the lower grade needs. With the additional space, modern facilities and increased curriculum, these needs will be met.

Over 35 courses are offered in the industrial-arts laboratories. There is, however, a happy relationship with the school of engineering, which makes it possible for the student to take additional shopwork under industrial-arts instructors. The content of these technical courses in the engineering shops has been closely integrated with the work done in the industrial-arts laboratories. Periodic staff conferences regarding course content have brought about a closer relationship with the other departments. Courses offered by the school of engineering exclusively for industrial-arts students include: engineering drawing, architectural design, auto mechanics, forging, welding, and foundry work. A brief grouping of the course offering in the industrial-arts laboratories may be of interest.

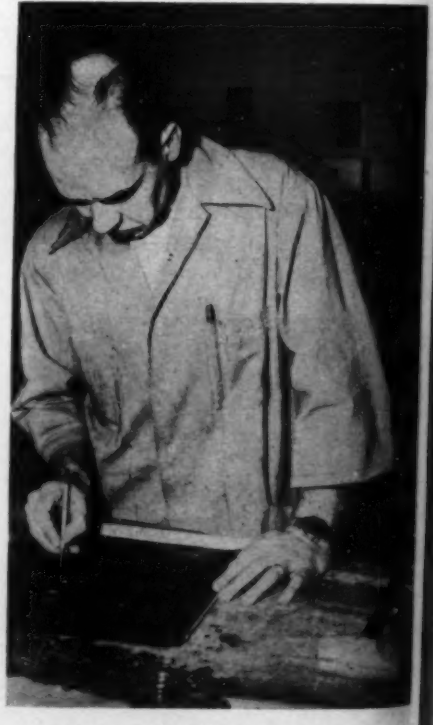
The woodworking division offers several elementary and advanced courses in hand tool operations, furniture making, carpentry, cabinetmaking, period furniture, wood turning, boat building, upholstering, finishing, caning, tapestry, and inlaying. Students in this division are given considerable freedom in the selection and planning of projects. This encourages creative thinking. However, closer supervision and more individualized instruction is required because of the variety of projects being constructed.

The courses offered in the metal area are planned to equip the prospective industrial-arts instructor for teaching the general metals or for specializing in any particular phase of the metal field. The background of basic skills and information is given in the beginning courses, sheet metal, art metal, machine shop, and foundry. Courses in auto mechanics and welding are offered for rounding out a program when a student wishes to concentrate in the metal area.

A new course in general metalwork for the elementary teacher focused on the needs of a resource person for the elementary grades has been added to the curriculum.

In all metal area courses, projects are made as samples for a teaching situation at different grade levels.

(Continued on page 135)



Art metalwork attracts many men and women

The Leavenworth High School Vocational Annex

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Long range planning for the public schools of Leavenworth, Kans., include a new high school plant which will adequately house modern industrial arts and vocational shops. In the meantime, to provide room for a constantly increasing enrollment, find space for a new general metal laboratory, and for a Veterans' On-the-Farm Training Course, it became necessary to locate additional space for immediate use.

Located near the high school was an old building with two floors 52 by 100 ft. which the Leavenworth Board of Education purchased and successfully adapted to school use at a reasonable cost.

The first step in converting the building was to replace the numerous wooden supports of the second floor with a carefully planned framework of I beams, supported on 4-in. standard pipe columns, resting on reinforced concrete bases. The ceiling and roof supports on the second floor consist of already existing 8 by 8-in. wooden columns. Concrete was used for the ground floor. For the second floor ¾ by 3¼-in. tongue and grooved fir flooring was used over a ¾-in. tongue and grooved yellow pine subfloor laid diagonally to the joists. Wood floors were sealed with penetrating seal and waxed.

New steel architectural projected sash were installed in all window openings, and adequate fluorescent lighting was provided in all rooms.

For interior finish ½-in. tinted plaster on all exterior walls, ½-in. insulation board on both sides of 2 by 4-in. stud partitions, with ½-in. fir plywood panels, covering the lower 4 ft., and ceilings of ½ by 16 by 32-in. acoustical tile board on 1 by 3-in. furring strips were specified.

Woodwork was stained and varnished. Two coats of water base casein paint in pastel color to match outside walls was used on all interior walls.

All of this gave us our up-to-date Vocational Annex. This transformation from an old warehouse to a modern school plant shows economical planning and is a source of satisfaction to patrons and taxpayers.

The lower floor, on the ground level in the rear, houses the general metal laboratory and the farm shop. The upper floor is on the street level. It provides rooms for the woodshop, mechanical drawing, retail selling, and offices for the director of adult and vocational education.

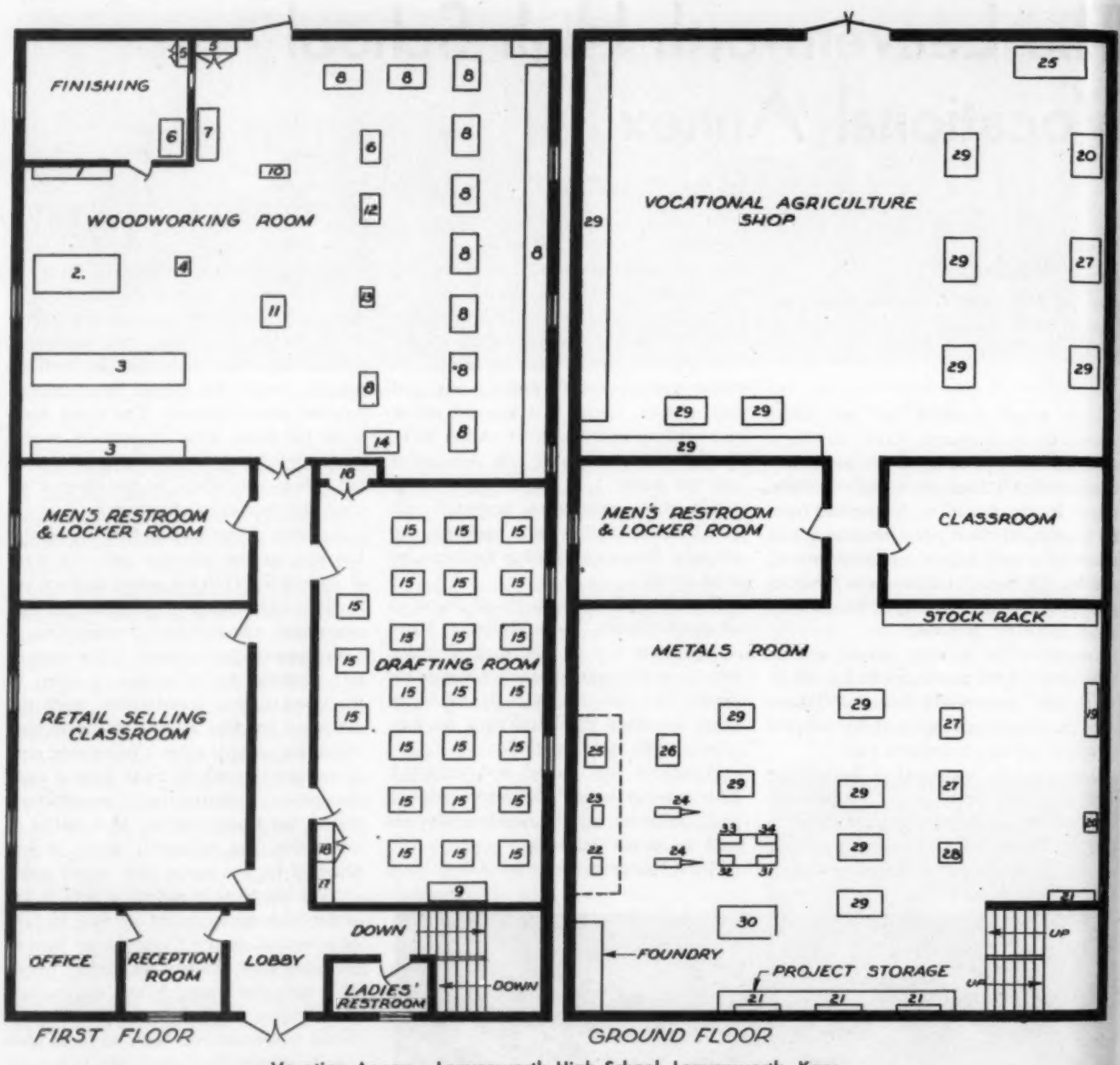
Members of our faculty have set up the following as the purposes and objectives of industrial arts in the senior high school.

"The industrial-arts program in the senior high school is best if based upon a comprehensive background. In the elementary program due recognition is given to the manipulative, investigative, aesthetic, and social impulses while in the junior high school the pupil is given a panoramic view of industry through the broad areas of communication, construction, manufacture, power, and transportation. As a matter of orientation, the horizontal spread is emphasized for the junior high school pupil.

"The emphasis in industrial arts in the senior high school might be said to take on a vertical aspect. Choices have been or are being made limiting the student to one or a very few areas. A new emphasis is placed upon manipulating skills. The enriched understandings begin to focus upon specific details. For many, the industrial-arts program becomes truly prevocational. As an elective, industrial arts in the senior high school must provide specialized experiences and learnings which are intensive and in keeping with current practice. Since the majority of students end their formal education with graduation from high school, their industrial arts experiences may have distinct vocational implications."

In the general metals laboratory the student is offered bench and sheet-metal work including: planning and layout, cutting, folding, forming, wiring, seaming, and grooving, punching, riveting, beating, sold-

Exterior of vocational annex building



Vocation Annex — Leavenworth High School, Leavenworth, Kans.

1. Clamp rack
2. Glue table
3. Lumber rack
4. Mortising machine
5. Tool cabinets
6. Desk
7. Jointer
8. Workbench
9. Teacher's desk
10. Planer
11. Saw
12. Grinder
13. Bandsaw
14. Band
15. Drafting table
16. Storage
17. Plate racks
18. Storage
19. Lathe
20. Grinder
21. Tool panel
22. Melting furnace
23. Gas forge
24. Anvil
25. Arc welding
26. Gas welding
27. Drill press
28. Hacksaw
29. Workbench
30. Sheet-metal bench
31. Forming rolls
32. Rotary machine
33. Brake folder
34. Stakes

ering, annealing, bending and twisting, finishing, drilling, filing, grinding, sharpening tools, cutting threads with tap and dies, and metal spinning.

Work in hot metals includes forging, gas and electric welding, and foundry. Work with machine tools covers simple operations on the engine lathe, cutting with a power hack saw, and drill press work.

Beginning woodwork and mechanical drawing are combined in a one-year course. This is a course for freshmen or students enrolling in the subject for the first time. The purpose of this work is to give an introduction which will acquaint the student with these subjects and form a basis for more advanced work. The woodwork instruction emphasizes the use of hand tools. Through the making of simple projects of the student's own choice the fundamental operations are taught. The drawing portion of the course covers simple sketching, the use of drawing materials and instruments, and the ability to make and read simple working drawings.

The second course in woodworking is

(Continued on page 136)

Industrial-Arts Building at Western Washington College of Education

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One of the features of the *Golden Anniversary* celebration held in honor of the first fifty years in the life of Western Washington College of Education, Bellingham, Wash., was the laying of the cornerstone of the arts building. This building, first planned for the industrial-arts department,[1] was changed during the late stages of the designing period to include additional space on the second floor for the art department. The bringing together of these two departments under one roof appears to be a satisfactory arrangement for closer association in the consideration of common problems pertaining to the arts and is in line with present-day trends in general education objectives.

The old industrial-arts building, a three-story frame structure completed for the fall term in 1913, has been in constant use until the 1950 summer quarter. This, it has been reported, was the first organized department in the state for training teachers in the manual arts.

[1]See, *W.E.A. Journal*, January, 1945.

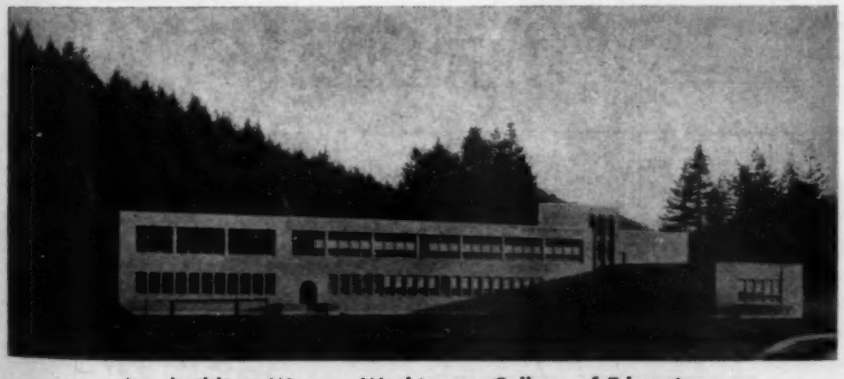
Industrial Arts in the Campus Elementary School

Appreciation of the industrial arts is to be seen in the teaching areas of the Campus Elementary School which was dedicated in May, 1943. Teaching suites, provided for each of the six grades, include a workshop area with woodworking benches scaled to the size of the children. Each workroom, adjoining the classroom is provided with tool cabinets for wood, metal, clay, nails, screws, paints, and other supplies. The tool cabinets are supplied with tools of appropriate kind and size. Educators and parents alike appreciate this contribution to a child's education through these early experiences with materials.

The Old Industrial Arts Building Becomes Obsolete

Following World War II the facilities of the old industrial-arts building became increasingly inadequate and plans were started for a new building. As materials became more plentiful a definite building program got under way, given impetus by the unprecedented development of the northwest region. The rapid growth of population and industry in Washington state since 1940[2] as a result of the huge hydroelectric developments on the Columbia River, wartime industrial conditions, and an interest in the northwest region by the returning G.I.'s[3] all served to tax the college facilities. After some delay, the construction of the arts building was begun. Two wings were added later to the main section.

[2]Official 1950 census released by the White House shows a population gain of 37 per cent since 1940.



Arts building, Western Washington College of Education, Bellingham, Wash.

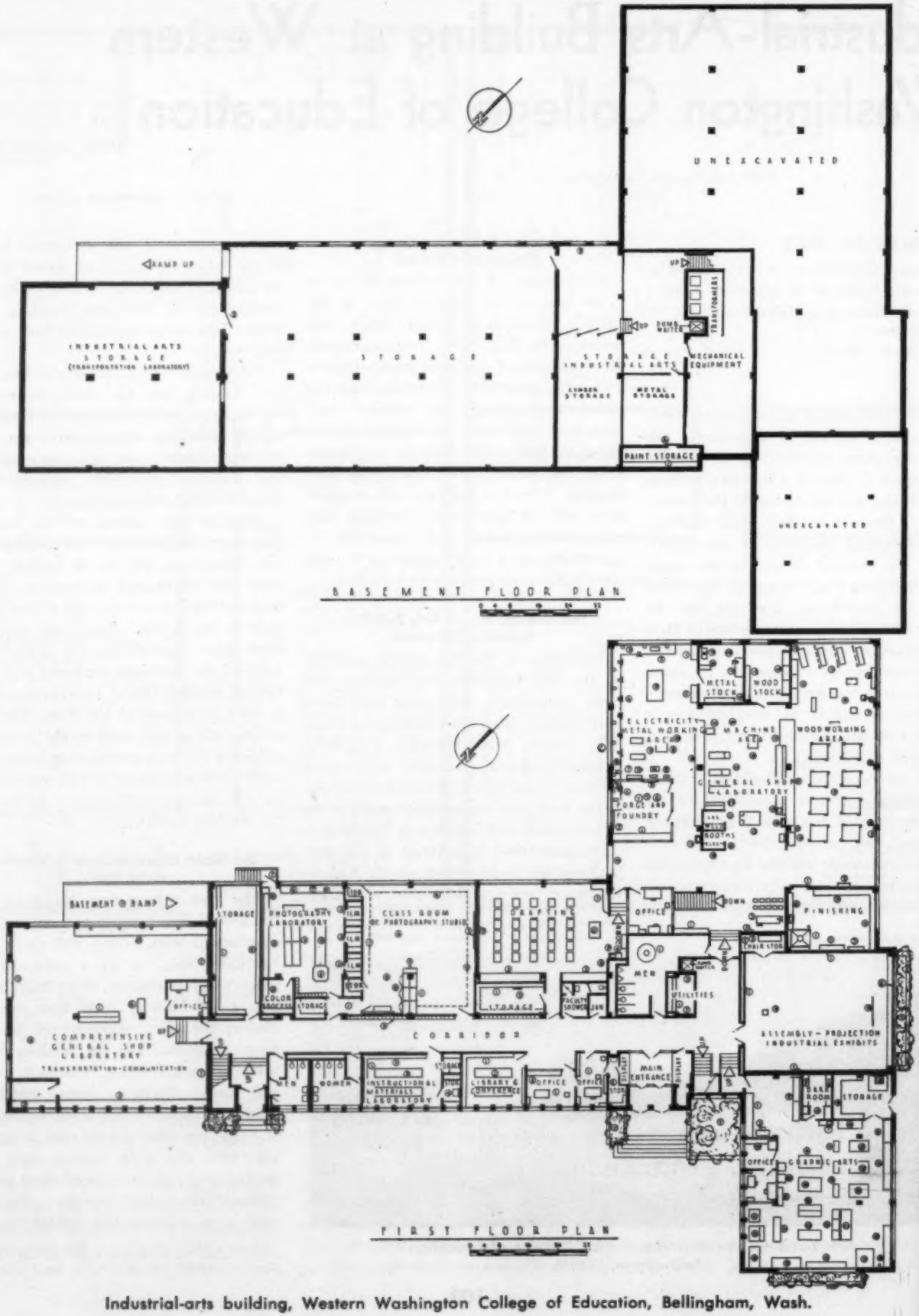
Constructed of reinforced concrete, the arts building has two floors above the the basement with a mechanical room for heating controls, transformers, gas, air, and water controls, etc. It is reported that this building will cost approximately $800,000 when fully equipped.

Some of the features of the interior planning of the areas devoted to industrial-arts instruction will be of interest. The walls are constructed of concrete blocks between the classrooms, but a few areas such as the library, offices, and assembly room have plaster over the blocks. The walls of the corridors are faced with buff colored ceramic tile. A brown colored tile is used as a base at the floor. The buff colored tile is also used in the washroom adjoining the large general-shop laboratory, and in this laboratory for wall sections and for the interior and exterior surfaces of the welding booths.

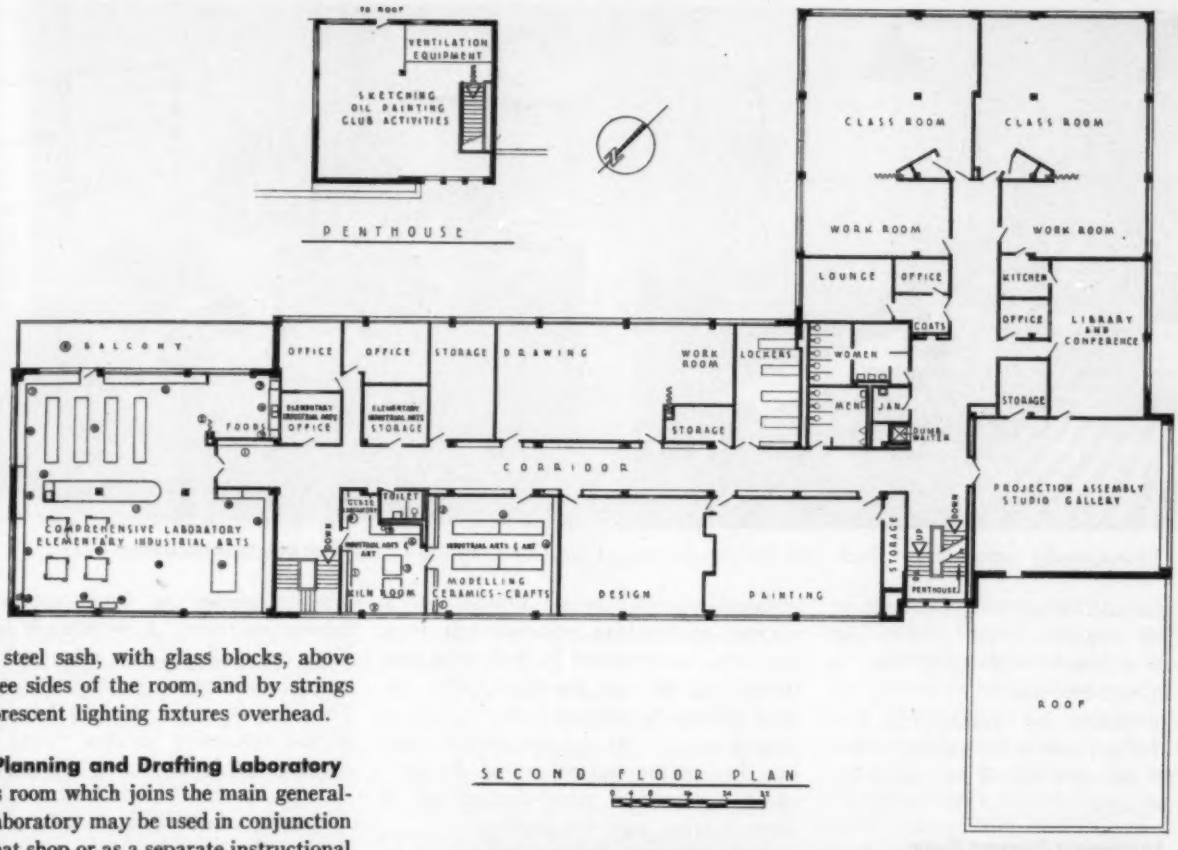
The Main General-Shop Laboratory (First Floor)

The main general-shop laboratory may be divided for use by one or more instructors to serve as two unit shops, as a composite shop, or as a comprehensive general-shop laboratory. As an instructional area it has 5388 sq. ft. of floor space including the office, storage, and finishing rooms, with facilities for teaching woodworking, metalworking, electricity, wood and metal finishing, home mechanics, plastics, and others. The adjacent planning and drafting room can be used in connection with this main general shop when desired, and a glass enclosed office permits observation of these activities. The large work area is adequately lighted by glass

[3]See, "They Still Go West — Young and Old," *Reader's Digest*, November, 1950, p. 114.



Industrial-arts building, Western Washington College of Education, Bellingham, Wash.



set in steel sash, with glass blocks, above on three sides of the room, and by strings of fluorescent lighting fixtures overhead.

The Planning and Drafting Laboratory

This room which joins the main general-shop laboratory may be used in conjunction with that shop or as a separate instructional unit. The floor space, excluding the storage room, is 972 sq. ft. One wall section has 99 lock drawers with each drawer large enough for a 20 by 26-in. drawing board and the student's drawing supplies and equipment. The drawing board rests on two cleats near the top of each drawer. Another wall section holds an adequate number of storage drawers with cupboards for additional drawing boards when needed. The storage room contains shelves on three sides with a sink. Thirty individual drawing desks and a large drafting table having a universal drafting machine limits the present seating capacity of this room. Additional equipment includes a paper trimmer, a cupboard for drafting tools, and a B & W printer.

Section of woodworking area — general shop laboratory

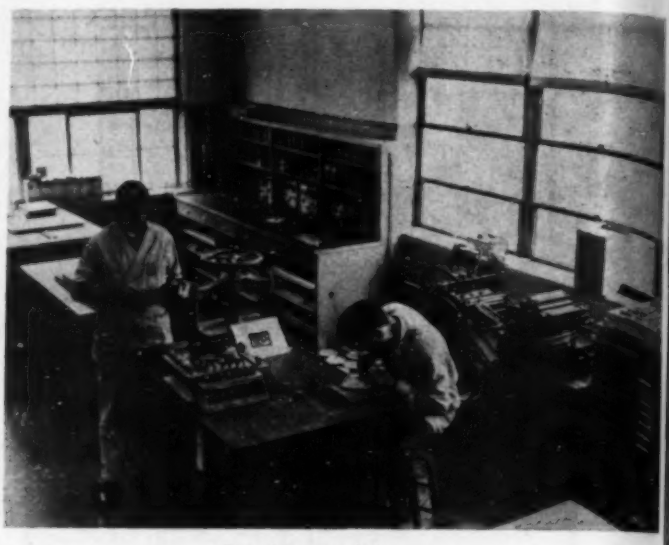
The General Photography Laboratory

Since photography has grown to be one of the very important industrial activities being used in practically every phase of industry, it has reached new importance in industrial-arts education. This teaching suite, comprised of approximately 2124 sq. ft. of floor space includes a large darkroom for general processing of contact and enlarging paper; a smaller darkroom for color processing; three small darkrooms for film processing; a camera room or studio which can also serve as a general classroom; and three storage rooms. The equipment is modern and of high quality.

The studio area has a graphic view camera and a special tripod; overhead tracks for curtains; a boom light; a baby-spot light; a number of floodlights, two of which are fitted with *snoots* and *barn doors*.

First-class stainless steel photoprocessing tanks are to be found in all of the darkroom areas. These are fitted with mixing valves with attached thermostatic temperature controls made by a well-known manufacturer in the photographic manufacturing field. The contact printers

Photography laboratory — darkroom area.



Graphic-arts laboratory

are of standard design and manufacture, as are the projection printers which can take care of from 35mm. strip film to 4 by 5-in. cut film sizes.

A copy camera for making strip film, and a printing machine for making photocopies are included also in the equipment list of this area.

Equipment Storage Room

This room has high sections of shelving which extend the full length of three walls. This area has 972 sq. ft. of floor space. The floors, walls, and shelves, are finished in attractive color tints.

Power, Transportation, and Communication Laboratory

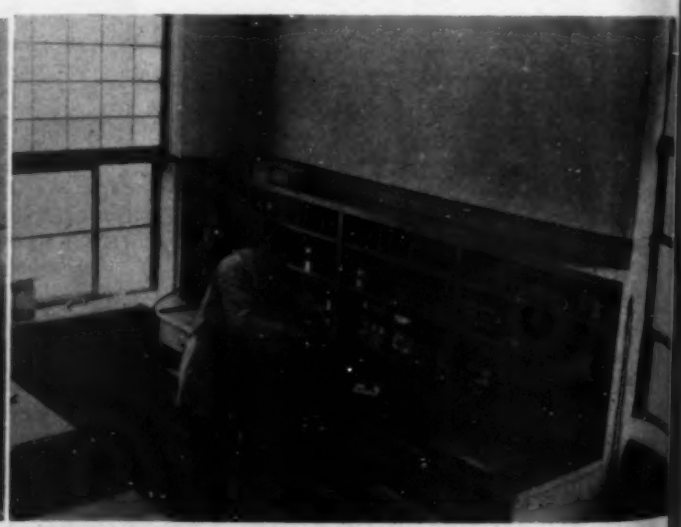
This is a general-shop laboratory, so designed that it can be utilized for a number of teaching situations. It is a large area unobstructed by walls with gas, compressed air, and electrical outlets for small appliances and machinery. The floor is finished in smooth concrete and the large exit door at the end will admit an automobile or truck or allow the removal of boats or other large size projects.

A double-faced tool cabinet placed in a central location is provided with glass sliding doors. Near by is a sink with an oversize trap. A storage cabinet extending the length of one wall is fitted with an adequate number of drawers. The total floor space amounts to approximately 2750 sq. ft. This room is well lighted from extensive window surfaces on three sides and by strings of fluorescent lighting fixtures overhead. A workbench extends along one wall and two other wall areas have blackboards and cork pin-up boards. The equipment has not yet been placed in this laboratory pending future developments.

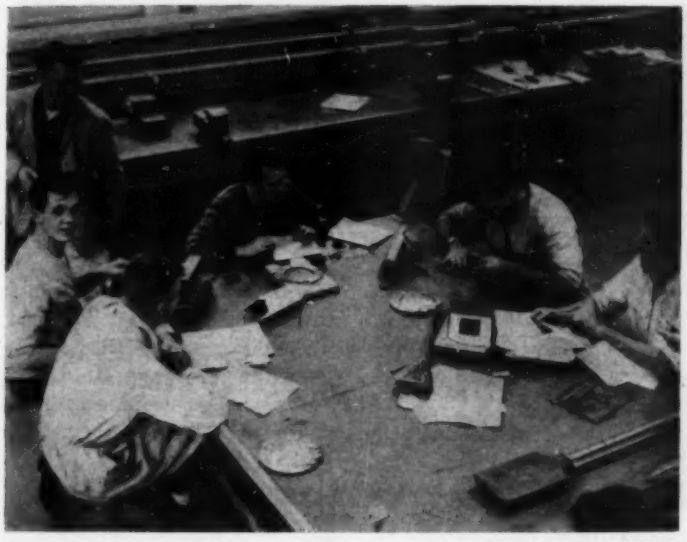
Instructional Materials Laboratory

This is a small laboratory designed for instruction in and development of visual aids for industrial-arts teaching. It is perhaps unique as an industrial-arts development, as such an area is not to be found in the majority of the published plans devoted to industrial-arts instruction on the college level. The proximity of this area to the photography, graphic arts,

Graphic-arts laboratory



Graphic-arts laboratory



Metalworking and electrical section of the general shop laboratory

library, general-shop, and drafting rooms, is an advantage for ease of instruction and working conditions. The total floor space of this area, including the two storage rooms, is approximately 405 sq. ft.

The Main Office, Reception, Assembly, and Library Areas

The main office area includes the office of the department chairman, a reception office, a department library, and a vestibule having show cases on two sides. The library and seminar room has an area of 252 sq. ft. The offices are finished in natural birch with attractive floor and wall colors, and are furnished with attractive steel furniture. The vestibule is paved with red quarry tile and is lighted by fluorescent border lights recessed in the cornice near the ceiling. The two sets of double doors and trim are made from aluminum. The walls of the display cases are of corkboard covered with monk's cloth.

The assembly and gallery area is a very attractive room having approximately 1248 sq. ft. of floor space, excluding the adjoining storage area. The floor is covered with red asphalt tile having a black mottled pattern. Shadowless lighting fixtures give a desirable spread of light over the room for exhibiting purposes. The acoustics are excellent due to the corkboard surfaced walls covered with buff colored monk's cloth. Daylight is admitted through a long window placed 6 ft. from the floor along one side of the room. Draperies on traverse rods are pulled to darken the room when it is used for the projection of pictures. A beaded projection screen can be lowered from the ceiling. An adjoining storeroom has a chair car for storage or transporting the folding chairs.

This area was designed for displays of student work; industrial displays; still and motion picture projection; industrial-arts student and teacher group meetings, etc. A small kitchen directly across the hall is provided for serving refreshments. This kitchen has a complete kitchen-type cupboard and sink with plastic covered counter space on either side. An apartment size electric range and a refrigerator complete the equipment in this area.

The Graphic Arts Laboratory

In this laboratory instruction is given in offset lithographic printing, platen press work, silk screen printing, wood engraving, etching, book binding etc. It also has a photographic darkroom for making the process plates and plans call for the purchase of a process camera. Two offset duplicators are in use at the present time and a heavier production offset printing press will be added later. Plans also include the addition of a cylinder press to assist in the production printing for the college. This laboratory has approximately 2120 sq. ft. of floor space and is lighted by indirect lighting fixtures.

The Elementary Industrial Arts Laboratory (2nd Floor)

This large well-lighted laboratory is devoted to problems in industrial-arts teaching at the elementary level. Steel sash extends around three sides of this area and an ample supply of artificial light can be supplied from overhead indirect lighting fixtures. Well equipped with storage cabinets of various kinds, this room has a floor area of approximately 2618 sq. ft. over which is distributed such items as a display case, a tool cabinet, a work sink, floor looms, woodworking benches, a power jig saw, a motor buffer, a bench with a miter box, several worktables with chairs, and outlets for compressed air, gas, and electricity.

A corner alcove provides an area which may be closed off with a Modernfold door. This section is equipped with kitchen facilities for instruction in food industries. The storage room and the instructor's office for the laboratory are located near the entrance and are reached from the main corridor.

The Ceramics Laboratory

This area is shared with the art department and is divided into two workrooms . . . a general *workroom* and a *kiln room*. The workroom has approximately 672 sq. ft. of floor space. The furniture in this room consists of a glass enclosed display cupboard, a work cupboard with two sinks and storage shelves, worktables and chairs, and a wall cabinet extending the length of one side of the room. This cabinet is divided into an adequate number of metal lined lockers for storage of unfinished clay articles. The kiln room has ample storage facilities along the three interior walls; workbenches with storage bins beneath for clays, glazes, plaster of Paris, etc. A sheet-metal canopy with forced air exhaust extends over the kiln area. Outlets are provided for compressed air, gas, and electricity. This kiln room has a floor area of approximately 366 sq. ft. in which is located an electric kiln (plans provide for a second kiln), an electric-driven pottery wheel, a portable spray outfit, etc.

Equipment and Materials Storage Areas – Basement

On the basement level storage space is provided for lumber, metals, paint materials, etc., to the extent of 2100 sq. ft. These materials may be unloaded outside this area and passed through a hinged window, or the truck may back down the ramp and unload at the storage room door. A freight-type roll-up door, with the opening at the same height as the bed of a delivery truck is also provided for on the floor above in the main general-shop laboratory as a loading or unloading area.

Planning and drafting area

Architectural Details

Floors: Three types of floor surfaces are to be found in the various work areas. The main general-shop laboratory has a wood block floor, end grain exposed. The finishing room, foundry, and storage rooms are finished with smooth concrete on the floors, while the majority of the other workrooms are finished with asphalt tile on the floors. The power and transportation laboratory is finished in smooth concrete and contains a floor drain. The kiln room, likewise, is finished in smooth concrete.

Walls: The walls between the classrooms are concrete blocks, unfinished, and painted to match the particular color scheme of each area. The corridor walls are faced with a smooth ceramic tile of a buff color. These same tiles are used to face the inside and outside walls of the welding booths; also on the interior walls of the washroom area; and on two 6-in. walls found at the sink locations in the main general-shop laboratory. Glass blocks are used as part of the upper walls above the windows of the main general-shop area. Plastered walls are used in the offices, library, assembly hall, and kitchens.

Lighting: Both artificial and natural lighting are utilized. The two large general-shop laboratories, besides the extensive areas of steel sash and glass blocks for natural lighting are also given overhead lighting from strings of fluorescent fixtures. Other areas are lighted by natural light or with direct or indirect lighting fixtures.

Ventilation: Ventilation is controlled by automatic or semiautomatic devices which cause circulation of air or force out fumes by means of suction fans.

Heating: The general heating is operated automatically by convectors located in the corridors. Electric-driven convectors are used in some areas to supply special heating needs.

Removal of Dust: A system of ducts connected with individual machines draws off dust and shavings to be collected in a hopper on the exterior wall of the main general-shop laboratory. This system is operated by a suction fan located on the ceiling of this room and near the location of the dust collector. Three *floor sweeps* extend to the floor from this collection duct system at three locations in the woodworking area. Dust and shavings may be swept into the flared opening after swinging the trap door up out of the way.

Cabinets: The cabinetwork is made from fir and faced with natural birch. An exception to this is found in the main general-shop laboratory where all of the surfaces are painted according to the scheme for *color conditioning*.

Tool Panels: The tool panels are made of fir with hardwood tool hangers attached, and painted to harmonize with the attractive color scheme of the laboratory.

Bulletin Boards: The bulletin boards are made of plywood covered with cork facing and framed in natural birch.

Coloring: Different colors are used on both floors and walls to designate the different work areas. Some attention was given to the psychology of color when planning the interior color of the various laboratories. The walls of the large darkroom, as well as the small darkroom, were painted green and a green tile of mottled design was used on the floors. Putty-colored mottled tile was used in the studio room. Red-mottled tile was used in the corridors. Black-mottled tile was used in the darkroom areas, etc. The upper walls of the corridors were painted an attractive yellow.

Power: The electric power is brought to the various areas from a transformer located in the basement mechanical room where the outside electrical supply is transformed to 208 *v.* and 216 *v.* circuits.

Drains: Drains are located in the floors in the work areas where a floor drain is likely to be needed.

Ceilings: All ceilings, including those in the corridors, are covered with acoustic tile.

Special Installations: Special installations include a fireproof door at the entrance of the finishing room, and explosion-proof switches and other electrical outlets in that same area. Compressed air outlets for air tools, dusters, spray guns, air brushes, brazing torches, and for special heating torches, ovens, or burners, are provided at appropriate locations. An adequate number of electrical outlets are located for a.c. current to drive power tools and serve the need for service connections to filter, spot, and floodlights, contact and projection printers, and a host of other uses to be found during the course of instruction. D.c. current is piped to a series of outlet boxes located along the wall in the main general-shop laboratory. Gas outlets are in place to serve the many uses for gas ovens, brazing, melting furnaces, forge, and bunsen burners.

All gas, compressed air, and electrical lines, may be controlled from a single location in the mechanical room in the basement. Branch lines are also possible to control by valves or master switches.

Fumes or excessive heat are exhausted through special ducts controlled by fans located on the roof of the building.

Exterior Features of the Building: (B) balcony, (C) waste collector, (V) ramp leading to basement storage, (Y) planting boxes.

Interior Features of the Building: Lockers in wall of corridor.

Description of Items

I. *The Main General-Shop Laboratory* (First Floor)

A. *Bench Woodworking and Machines Area:*

Item *Title and Description*

1 Sliding fireproof door leading to finishing room
2 Rack for bar clamps
3 Shelf for oilstone
4 Teacher's wall desk
5 Eight 4-place woodworking benches
6 Storage cupboards for unfinished projects
7 Jig saw
8 Belt sander, shaper, jointer, band saw, drill press, etc.
9 Wood-turning lathe
10 Tool cabinet with vertical sliding sash
11 Four wood-turning lathes
12 Compressed air outlets
13 Surfacer, 24 in.
14 Sink, with drinking fountain
15 Tool dresser
16 Table saw, 10 in.
17 Bench, with storage cabinet
18 Storage shelves for short pieces of wood
19 Lumber storage rack

B. *Electrical & Metalworking*

a) Bench and Machine Area:

1 Electrical panel
2 Bench with sink
3, 4, 6 Benches fitted with outlets for gas, compressed air, a.c. and d.c. electricity, vises, gas furnaces, etc.
5 Layout table, fitted with two stake plates
7 Spinning lathe
8 Two grinding and buffing machines
9 Metal-sawing band saw, and a milling machine
10 Cabinet for tool storage and for supplies
11 Tool cabinet with vertical sliding sash
12 Sheet-metal machines: brake, slip rolls, shearing machine, etc.
13 Sink, fitted with drinking fountain
14 Loading or unloading exit with roll-up metal freight door
15 Motor generator
16 Storage batteries
17 Cutting bench
18 Storage rack for bar metal
19 Power hack saw
Electric welding, and gas welding booths
Three machine lathes
Metal shaper

b) Foundry and Forge Area

1 Molding bench with tool racks
2, 6 Tool panels for forging tools
3 Workbench fitted with vise, compressed air outlet with regulator, gas cock, Prestolite tank, etc.
4 Brazing torch
5 Gas-fired melting furnace for ferrous and nonferrous metals
7 Gas-fired melting furnace for nonferrous metals
8 Gas-fired forge

c) Demonstration Area

1 Rod with coat hangers for wraps, shop coats, etc.
2 Blackboard, and pin-up board
3 Demonstration bench fitted with wood and metalworking vises. Gas and electrical outlets near by

d) Finishing Area

1 Spray booth, fitted with compressed air regulator and spray gun
2 Paint supply cabinet
3 Heat convector
4 Workbench for finishing materials with shelves beneath
5 Workbench with storage cabinets beneath for student work
6 Workbench fitted with sink and stainless steel top for use in chemical coloring. Lead lined cabinets below provide for chemical storage

e) Washroom Area

Entrance to this area is gained from the shop or from the outside corridor

1 Wash fountain

f) Planning and Drafting Area

1 Blueprint and storage room. Shelves extend around three sides of this room
2 Sink for mixing duplicator chemicals, etc.
3 Lock drawers, 99 in number, large enough to hold a 20 by 26 in. drawing board, along with other drawing equipment. Drawers and cabinets on another wall section provide for additional storage of drawing boards and supplies.
4 Drafting table with a universal drafting machine
5 Sink
6 B & W printing machine
7 Glass case for books and drafting equipment
8 Blackboard with cork pin-up boards on each side
9 Paper cutter

II. *General Photography Laboratory*

A. *Camera Room, or Classroom*

1 Wardrobe case for wraps and books, fitted with hangers
2, 4, 7 Tracks for background curtains
3 Blackboard with cork pin-up boards on either side
4 Compressed air regulator for air-brush work
5 Tablet-arm chairs
8 An assortment of studio lights such as spots, floods, and a boom light. A graphic view camera, and a special tripod
9 Storage cupboards

B. *Darkroom Laboratory Area*

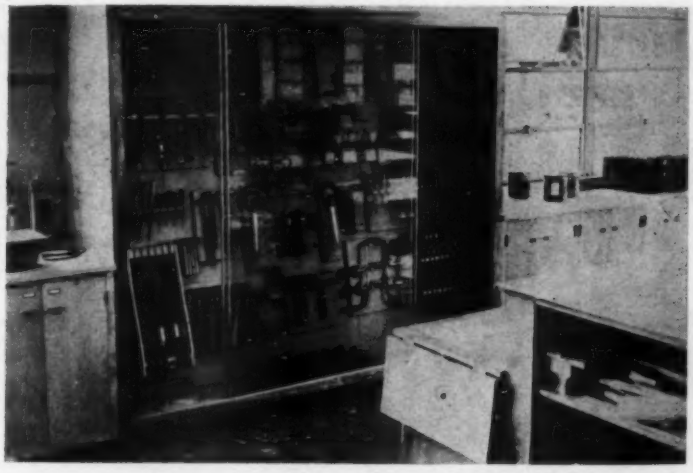
1 Walk-in light baffle. Doors have electrical contact switches.
2 Demonstration booth for teaching purposes
3 Film rooms fitted with stainless steel sinks and storage cabinets
4 Workbench with cabinet beneath
5 Paper trimmer
6 Print driers
7 Escape door exit
8 Film and paper drying cabinet
9 Workbench for contact printers and enlargers with tray storage beneath
10 Color processing room
11 Four stainless steel processing tanks fitted with thermostatic temperature controls. One stainless steel washing tank fitted with thermostatic temperature control
12 Workbench and cabinet for contact printers and enlargers with tray storage beneath

C. *Storage Rooms*

1 Shelves
2 Shelves

Power, Transportation and Communication Laboratory

1 Tool cabinet, double type, with glass sliding doors on two sides
2 Storage cabinets along wall
3 Workbench along wall
4 Machine area
5 Overhead door for loading or unloading exit
6 Workbench along wall
7 Blackboards; and pin-up boards, cork surfaced



Elementary industrial-arts laboratory

Tool storage area

Ceramics area

8 Sink with special jar-trap beneath

III. *Elementary Industrial-Arts Laboratory* (Second Floor)

1 Future display case
2 Modernfold door
3 Refrigerator
4 Kitchen cabinet and sink
5 Electric stove
6 Storage cabinet
7 Air exhaust
8 Storage cabinet
9 Worktables
10 Sink
11 Tool cabinet with glass sliding doors
12 Storage cabinet
13 Buffing wheel and grinder
14 Bench, with miter saw
15 Jig saw
16 Woodworking benches
17 Storage cabinet
18 Looms
19 Display cupboard
20 Storage cupboard
21 Workbench

IV. *Ceramics Laboratory*

A. *Ceramics Workroom Area:*

1 Display case with glass doors
2 Storage cupboard
3 Worktables
4 Storage cabinets

B. *Kiln Room:*

1 Storage cabinet
2 Pottery wheel, electric
3 Kiln, electric
4 Workbench with storage bins
5 Gas and compressed air outlets above bench

V. *Graphic Arts Laboratory*

1 Storage cabinet
2 Process camera (future location)
3 Opaqueing table for photolith work
4 Spinner for making photolith offset plates
5 Stainless steel photo tank with thermostatic temperature control
6 Workbench with storage cabinet
7 Sink
8 Paper storage cabinet
9 Paper cutter (proposed location of power paper cutter)
10 Offset duplicator
11 Drying cabinet
12 Worktable
13 Offset press
14 Type stand
15 Silk screen bench and cabinet
16 Compressed air regulator and outlet
17 Paper cutter
18 Worktable
19 Cylinder press (proposed location)
20 Platen presses
21 Worktable
22 Galley cabinet
23 Proof press
24 Imposing stone
25 Virkotyper
26 Type stands
27 Worktable
28 Worktable
29 A.T.F. "Chief" press (proposed location)
30 Offset duplicator
31 Bindery worktable
32 Bookshelves

VI. *Main Office and Reception Areas*

A. *Reception Office:*

1 Metal desk and chairs; metal file cabinet; typewriter, etc., telephone
2 Counter with sliding glass panes above and shelves below for storage purposes

B. *Office of Department Chairman*

1 Two built-in bookcases; metal file cases; three metal chairs; one metal desk
2 Sink; storage cupboards; rod for coat hangers; "Telkey" key system cabinet

C. *Library and Seminar Room*

1 Bookshelves on three sides of the room
2 File case
3 Typewriter

D. *Vestibule*

1. The display cases are lined with corkboard covered with buff monk's cloth, and enclosed with plate glass windows. Mazda and fluorescent lighting is used to light the interiors of the cases

E. *Assembly and Exhibition Gallery*

1 The walls are covered with corkboard, to the height of 6 ft. and covered with buff monk's cloth which gives excellent acoustical conditions
2 Motion picture projector for 16mm. sound, and a 35mm. projector for slides and film strips
3 Chair car providing space for 100 folding chairs
4 Stand for the movie and slide projector
5 Beaded screen, 5 ft.
6 Draw curtains

VII. *Instructional-Materials Laboratory*

1 Storeroom with sink; storage cupboards, etc.
2 Storeroom with storage cupboards
3 Storage cupboards; worktables, etc.
4 Gas cock
5 Blackboard with pin-up boards on two walls

VIII. *Storage Area in Basement*

a) Metal storage
b) Paint storage
1 Shelves along one side of the room
4 Fireproof sliding door
c) Lumber storage area
2 Hinged window to admit lumber or metal supplies, etc.
d) Storage area for the laboratory directly above
3 Hinged door

Conclusion

It is the hope of the many whose contributions have brought the plans for the enlarged department of industrial arts to fruition that the department may continue to adopt all that is new and worth while to the end that it will make a very real contribution to the field of industrial-arts education.

Technical Addition to the Tucson Senior High School

Robert D. Morrow, Superintendent of Schools, Tucson, Ariz.

About four years ago teachers, pupils, school patrons, skilled workers, businessmen, representatives from all groups of the Tucson school staff began making plans for a new technical and vocational building for our senior high school. A few months later a federal grant made it possible to translate some of the thinking of this group into tentative plans. These tentative plans were sent back to study groups where they were revised and re-revised by the schoolmen and the architects. The replanning took many months, but finally the revised plans and specifications were put out for bids.

The building cost (without furnishings and equipment) was $1,600,000, plus architect's fees. The school site cost approximately $200,000, and furniture and equipment cost about $500,000.

The building is being used from 7:40 A.M. until 10:00 P.M. Our night school and adult education programs are expanding rapidly. It seems that everyone wants to go to school.

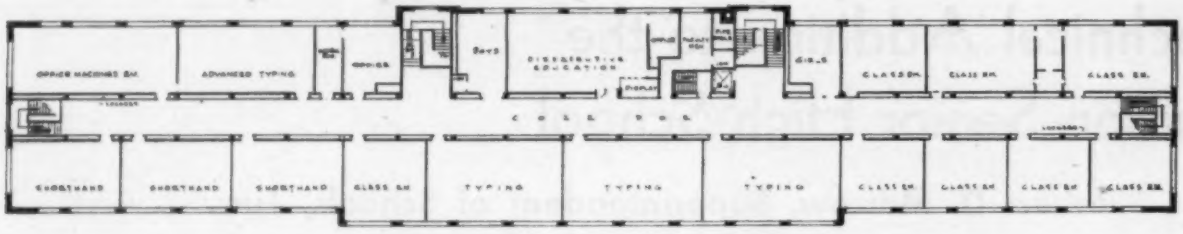
Of course some mistakes have been made, but the co-operative long term planning of the building eliminated many mistakes that would otherwise have been made. The school program is also being developed co-operatively.

Francis A. Vesey, assistant superintendent in charge of buildings and grounds of the Tucson schools, and C. A. Carson, assistant superintendent of schools, deserve much credit

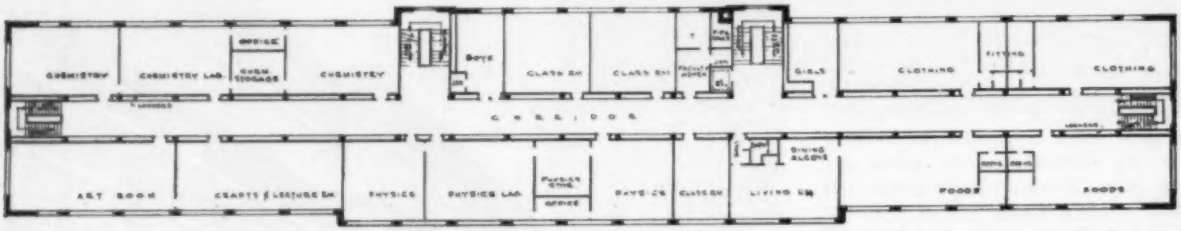
Details of street view, Vocational Building, Tucson Senior High School, Tucson, Arizona

The main machine shop is equipped with typical modern production machinery

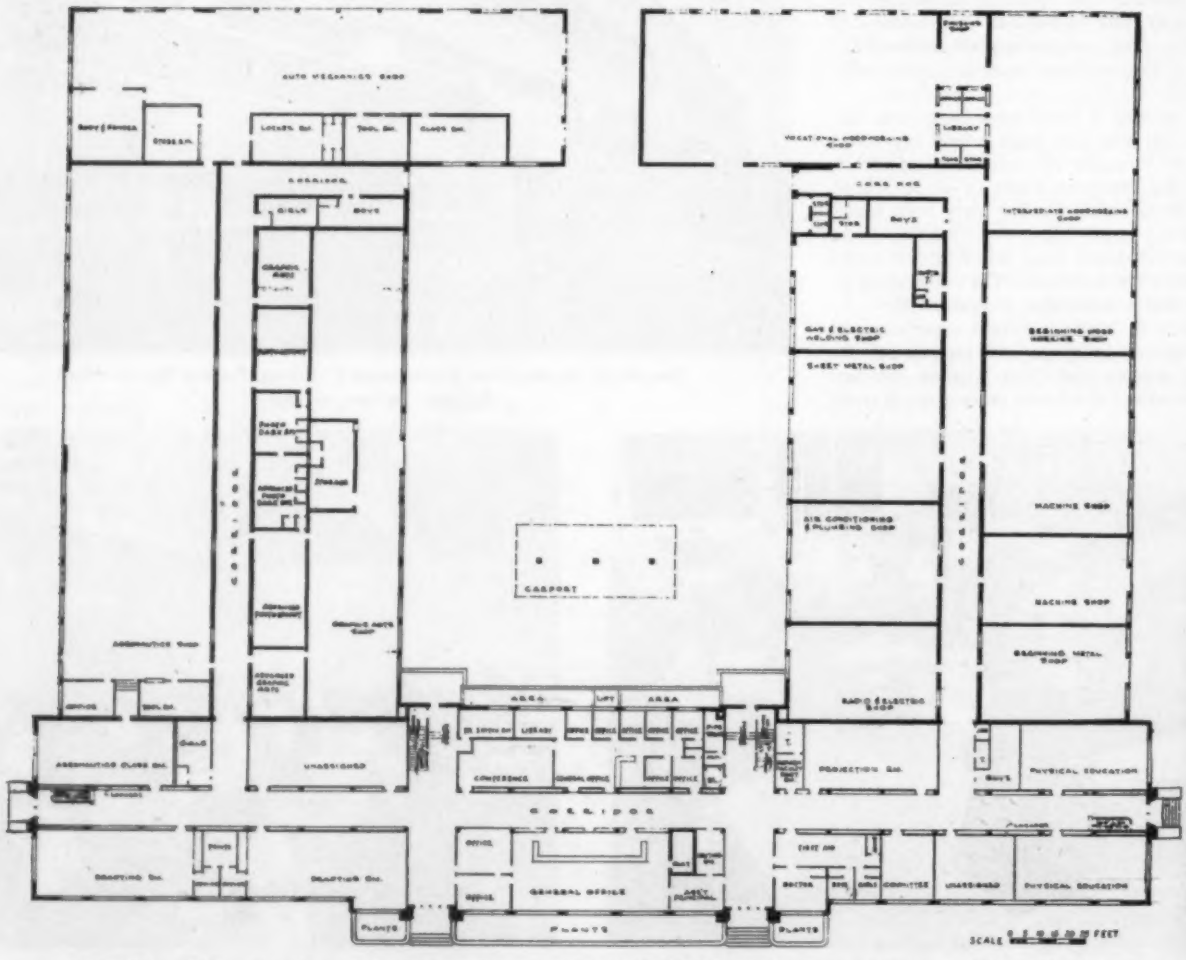
A typical business department room, the typing department, Tucson Senior High School Vocational Building.



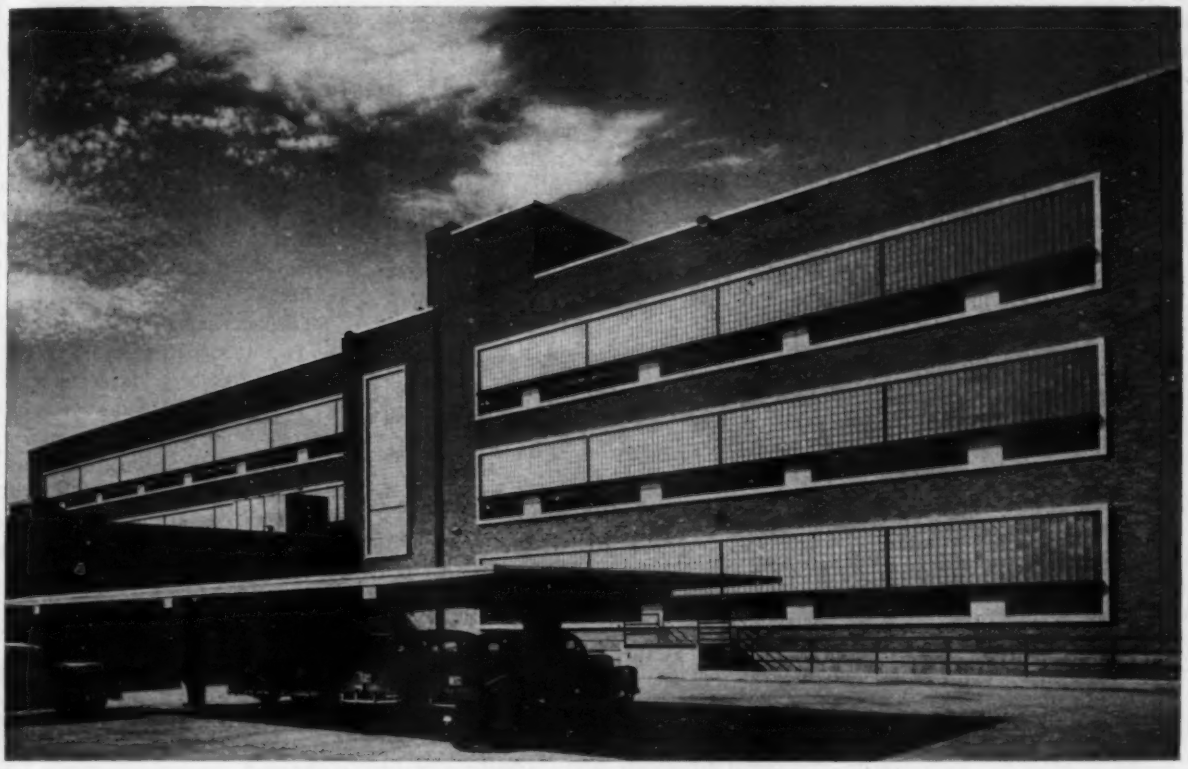
Third Floor Plan, Vocational Building, Tucson Senior High School, Tucson, Arizona



Second Floor Plan, Vocational Building, Tucson Senior High School, Tucson, Arizona



First Floor Plan, Vocational Building, Tucson Senior High School, Tucson, Arizona. — Place & Place, Architects, Tucson, Arizona



Vocational Addition, Tucson Senior High School, Tucson, Arizona

for this fine building. Mr. Carson worked with the various groups in all of their activities. Mr. Vesey not only worked with the planning groups but also personally inspected all construction work. Messrs. Place and Place of Tucson were the architects (and were most patient with the planners); the firm of Ashton and Joynt were the builders.

The special rooms — a school bank; a store (planned and completely equipped by Tucson merchants) for distributive education, store layout, display, merchandising, etc.; a homemaking department that includes a mirrored fitting room, powder rooms, automatic washers, etc.; art rooms with well-planned display cases; drafting rooms; science rooms; business machine room, etc. — all these practical areas delight both the teachers and the pupils.

Mr. Vesey gives the following information in regard to construction details of the building:

The building is designed so that all types of related instruction to vocational work is handled in a three-story structure. All shops are installed in the one-story structure attached to the main building. The original plan for the three-story part of the building called for a basement under the center section of the main building only, to be used as a group of storage rooms, the boiler room, and a crafts room. The revised plan called for a basement under the complete three-story structure, but no basement under the one story, or shop wings. The three-story part of the building is built with reinforced concrete throughout. It has curtain, or exterior, walls composed of 8-inch cinder block on the inside and 4-inch rough-faced brick on the exterior. All the interior walls and partitions are made of gypsum block, 3½ inches thick, plastered on both sides.

All main floors are finished troweled concrete and covered with ⅛-gauge burlap backed linoleum. Toilet and rest room floors are laid with ceramic tile, and walls are tiled with glazed tile to a height of 5 feet. All outside doors are stainless steel; lobbies, stairways, and landings are made of terrazzo; the edges of all stair treads have cast-iron safety strips, 3½ inches wide, on the front edge of each step. The buildings contain as many built-in features as possible, including all types of built-in storage cases, bookcases, special classroom-equipment storage, in addition to the regular built-in equipment such as that used in the home economics, commercial, art, and science departments.

There are two elevators in the building. One is used for passenger service, running from the basement to the third floor, and the other is used for freight service, running from the basement floor up to truck-bed height on the ground floor level. This freight elevator is a necessary addition to the building because much of the basement is used for storage. The freight elevator is of the hydraulic type, and the passenger elevator is a standard electrically operated type.

Acoustical treatment for classrooms and halls is accomplished by the use of perforated fiberboard, ¾ inches thick, that has approximately .60 sound absorption. The ceilings in the halls are lower than the classroom ceilings. The acoustical treatment on the hall ceilings makes the halls extremely quiet for students passing from class to class between periods.

The heating plant is located in a basement room and is composed of two gas-fired steel boilers that operate the hot water heating system piped to hot water convectors in every part of the building, including the one-story shop wings as well as the three-story structure. The building has six heating zones operated by indoor thermostats and outdoor anticipators. Each zone is controlled by a pump near the boiler, that pumps hot water to the respective zone called for by the outdoor anticipator or indoor thermostat. We feel that this type of control on heating will be far more satisfactory than the old standard form of hot-water heating since various parts of the building are either colder or warmer than the other parts, depending on the time of day and the exposure to the sun and wind. Each room is equipped with a hot-water convector, with a blower type fan used to distribute the air within the classroom. All the shops use the overhead fan-type convector for distribution of heat. We felt that the overhead type will be more satisfactory for shops than the floor type due to the space requirements and the economy of cost in the initial installation.

The window area to all classrooms and shops consists of light directional glass blocks in the upper portion of the window, with a vision strip (steel sash) about 30 inches wide. There is a space of 42 inches from the floor to the bottom of the glass blocks. The lower

member of this vision strip hinges in for fresh air and ventilation. At the bottom of the glass blocks and top of the clear vision strip a canopy extends out 18 inches in a continuous strip along the exterior of the building to keep direct sunlight from shining into the classroom. If it were not for this canopy, it would be necessary to install venetian blinds over the clear vision strip. The prism directional glass blocks reflect the light to the ceiling where it is distributed fairly even over the classroom.

The construction of the shop wings consists of standard cinder block interior walls, rough texture brick for the exterior walls, and steel reinforced concrete pilasters supporting the fabricated roof trusses. The ceiling and roof of the shop area is composed of fabricated sheet metal sheathing with 1½ inches of fiber insulation mopped on with hot tar and a three-ply built up roof mopped on the insulating board. Each shop is equipped with a wide overhead door so that trucks can be backed right up to the shop for the delivery of supplies, machinery, and equipment without any necessity of transporting through halls, inside doorways, and so forth. The entire shop area is equipped with a buss-duct system of wiring so that either 110 *v.* single phase, 210 *v.* single phase, or 208 *v.* three phase current can be tapped on at two-foot intervals from the buss-duct crossing the shop. All conduit for the wiring is run overhead and is exposed in each shop. By running the conduit exposed it will be an easy matter at a later date to make additions, alterations, and changes in wiring machinery.

The entire building, both the one-story shop wing and the three-story main structure, is cooled by evaporative cooling with 15 evaporative coolers run by 5 h.p. fans in each cooler. The cool air is piped through plenum chambers and duct work to every classroom and shop. In the Arizona country, with low humidity during the entire year, this is a very satisfactory way of cooling the building. It provides at the same time forced ventilation, since there is a complete air change about once every four minutes in each classroom and shop area.

Lighting throughout the building is accomplished by means of eight-foot slimline fluorescent fixtures with two rows of four-light fixtures continuous through all classrooms and four-light industrial fixtures continuous on eight-foot intervals across each shop area. The halls are lighted by continuous single-light stripping through the middle of each hall. The lighting has been so designed that each classroom or shop area will have a minimum of 35-foot candle illumination for night operation.

Birch trim throughout the building, green chalkboards, adequate bulletin boards and display cases, pastel colored walls, blond furniture, modern furniture and equipment make this building a most pleasant place in which to work. Simple lines and careful planning have created a building which is beautiful, fine, and functional. All of Tucson likes this new school building.

A CITIZEN'S OPINION ON THE NEW ADDITION

MARGARET GRAHAM TRIMMELL
Tucson, Arizona

We visited the new technical addition to the Tucson Senior High School today. So outstanding has been the school's record, under ex-principal, C. A. Carson, and present principal, Andy Tolson, and its newest building and equipment, that it has been receiving many visitors of late — architects, educators — from all over the United States, who plan the erecting of a similar type of school in their own communities.

This $1,600,000 vocational building is one of the three buildings which make up the Tucson Senior High School. The overall appearance of the building, with its functional modern design — glass brick, acoustical ceilings, evaporating cooling systems, lockers built into the wall, drinking fountains, blond desks, easy-on-the-eye green chalkboards and pastel classrooms, demands immediate attention.

Within these rooms and shops are offered advanced courses in millwork, distributive education, graphic arts, carpentry, engine aircraft and auto mechanics, machine shop, home economics, chemistry, physics, crafts, commercial art, welding, sheet metal, clerical practice, radio and electricity, with air conditioning and plumbing in the offing.

On the ground floor are to be found the nurse's, doctor's, and first aid rooms, two wings of shops that include woodworking, machine, sheet metal, graphic arts, gas and electric welding, radio and electricity, auto mechanics, aeronautics, and photography. Here are the offices of the assistant principal, R. T. Gridley, who is also principal of the expanded evening school; offices for the guidance and counseling department under Joe Young; the senior adviser, Danny Romero; head of testing services, Ray Webb; vocational director of industrial arts and vocational education, Louis Bazzetta; co-ordinator of curriculum, J. R. Peters; co-ordinator of apprentice training, R. A. Ganoung; and head of the distributive education department, Chester Sheaffer.

All departments in the school are divided into two subdepartments: (1) industrial arts, consisting of guidance survey courses and (2) vocational education which prepares the student for entry into a trade or craft. The aeronautics department occupies 8000 sq. ft. of space. Its equipment would have cost a quarter million dollars except that almost everything came via war surplus. The equipment includes a Link trainer, and aircraft engines, and there is an aviation engine repair shop, painting facilities, and equipment for working on generators, starters, etc. Milton Mallis, instructor in charge, informed us that a three-hour course in aviation mechanics comes under the vocational education program and prepares the student for various openings in the aviation industry. It is quite a highly specialized course attempting to turn out airplane mechanics. Some of the students are ready to take the government tests upon completion of the course. In the industrial-arts department there are one hour courses in model airplane building, lectures on aeronautics, and flying the Link trainer.

For those not in the know, the Link trainer, originally a $15,000 piece of equipment, simulates actual flying conditions, the student learning to fly without leaving the ground. The student also takes up navigation, meteorology, and civil aeronautics. Future plans include vocational training in aircraft mechanics and ground school.

Mr. Eager explained a bit about things in his department of auto mechanics. Equipment is all new and included in it is a dynamometer, a machine for simulation right in the shop of absolutely every road condition any car would find in actual driving. The mechanic testing the car watches instruments and in this way everything is under his observation at all times, and any mechanical trouble can be ascertained. There also are all types of electrical and carburetion testing equipment here.

(Continued on page 136)

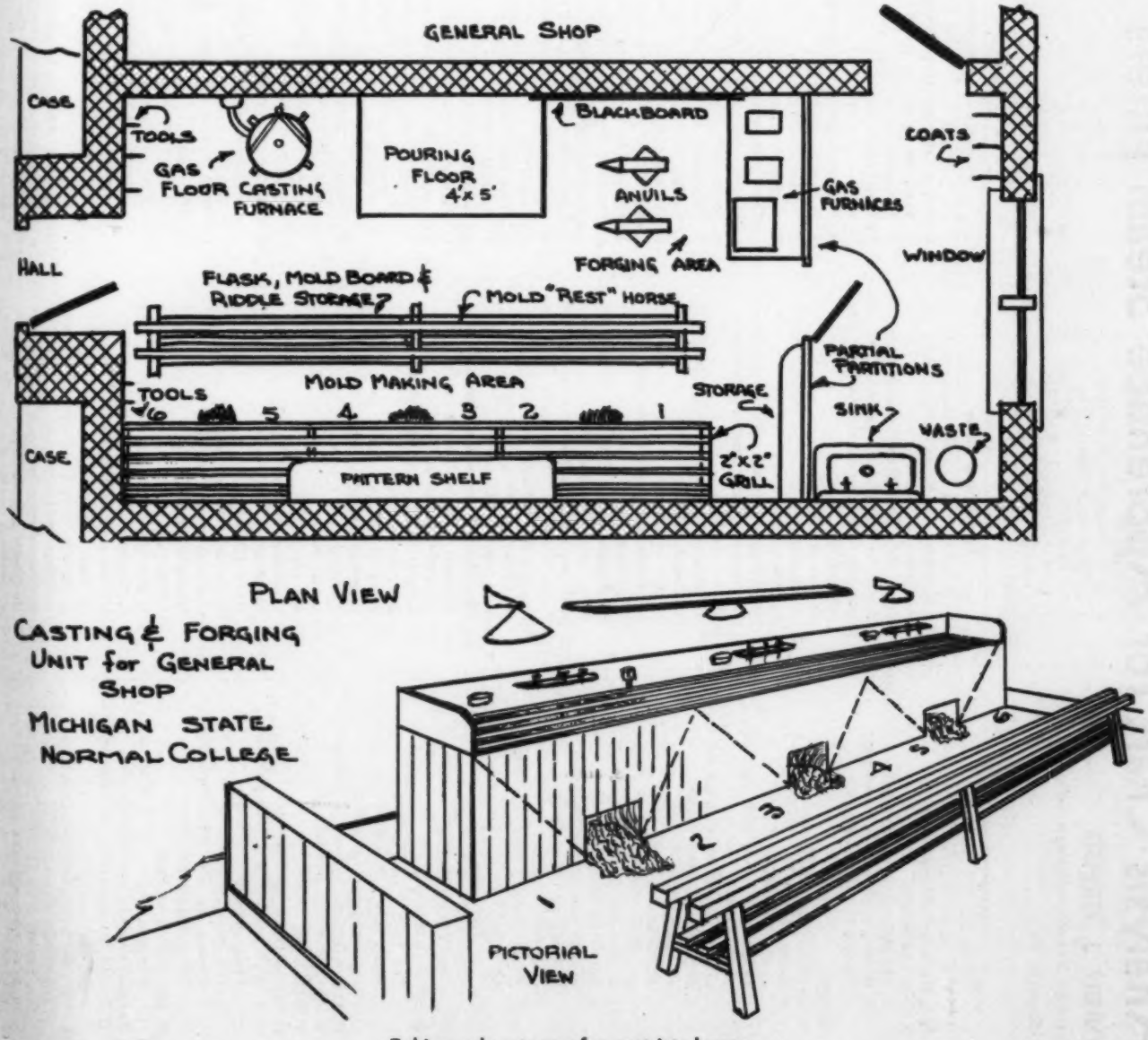
A Compact Metal-Casting and Forging Area

NORMAN RISK and GEORGE A. WILLOUGHBY
Michigan State Normal College
Ypsilanti, Mich.

The accompanying drawing illustrates how an available small room adjacent to a general shop has been converted into a metal-casting and elementary forging unit. The details are practically self-explanatory.

In our situation the shop is in charge of a responsible person while work is being done; however, if this were to be a part of the metalwork of the entire general shop program, the partition between the two shops should be glassed so that one instructor could be in charge of the entire shop program and could see all parts of both shops at all times.

Over a period of time it has been found that the shop is very valuable and that much valuable experience can be gained, and many castings made by the students.



Taking advantage of a restricted area

Analysis Chart for Apprentice Steam Fitters

ROBERT J. GREGG
Connelly Vocational High School
Pittsburgh, Pa.

Job processes	RELATED INSTRUCTION		
	Related shop theory	**Related shop mathematics**	**Related shop drawing**
1. Pipe fitting and fabrication for A. Pipe and fittings 1. Screwed 4. Sweated 2. Welded 5. Bell and spigot 3. Flanged 6. Brazed 2. Heating A. Installations of heating systems 1. Steam systems a) One pipe steam b) One pipe steam with vacuum air valves c) One pipe steam with air line valves d) Two pipe steam system e) Vapor system f) Vacuum system g) Differential system h) One pipe gravity steam 2. Hot water systems a) Two pipe gravity hot water b) One pipe forced flow c) Pressure system 3. Modern radiant heat installations a) Construction 1) Floor panel 2) Wall coil 3) Ceiling heating B. Boiler installations 1. Fire tube 3. Updraft 2. Water tube 4. Downdraft C. Piping connections to boilers D. Piping between boilers and radiators E. Air elimination installations F. Unit heater connections G. Special piping arrangements 1. Wall radiators and false water line 2. Piping around obstructions 3. Lift fitting installations 4. Cooling leg and drip connections for down feed supply riser H. Installations of traps 1. Thermostatic 2. Float types I. Installations of boiler return traps J. Installation and piping for automatic boiler water feeder K. Vacuum heating pump installations 1. Jennings 2. Dunham 3. High vacuum pump L. Controls 1. Differential controller and selector	1. Trade terms 2. Tools 3. Straight run pipe fitting specifications for screwed, flanged, welded, sweated, bell and spigot and brazed pipe and fittings A. Pipe data 1. Use of tables 2. Wall thickness 3. Thread length 4. Weight per foot 5. Proper nomenclature for ordering B. Fitting data 1. Pressure code 2. Depth of thread 3. Use of tables 4. Proper nomenclature for ordering C. Pipe hangers 1. Hanger data a) Use of tables 2. Temporary hangers a) Wire b) Rope D. Staging and scaffolds 1. Construction 4. General heating problems a) Miscellaneous procedure tables b) Pressure of liquids at rest heads c) Atmospheric pressure d) Weight, density, specific gravity e) Buoyancy f) Water head g) Elementary study of heat h) Temperature i) Specific heat j) A study of BTU k) Generation of heat l) Expansion m) Steam tables n) Work and power 5. Functions of heating systems A. Steam systems 1. One pipe steam 2. One pipe steam with vacuum air valves 3. One pipe steam with air line valves 4. Two pipe steam system 5. Vapor system 6. Vacuum system 7. Differential system 8. One pipe gravity steam B. Hot water systems 1. Two pipe gravity hot water 2. One pipe forced flow	1. Review of fundamental processes A. Fractions B. Decimals C. Percentage D. Ratio and proportion E. Solving simple equations and formulae F. Squares of numbers G. Square root H. Angles I. Circles, elements of 2. Computing areas A. Rectangular B. Triangular C. Circles D. Trapezoid E. Cone F. Cylindrical G. Pyramid 3. Computing volumes (cubage) A. Cube B. Cylinder C. Cone D. Frustrum of cone E. Pyramid F. Frustrum of pyramid G. Regular and irregular tanks 4. Measuring systems in construction work A. Architects elevation system 1. Bench marks 3. Floor levels 2. Contour lines 4. Column marking B. Decimal system in elevations 1. Digit nomenclature 2. Measurements with the decimal system a) Elevations C. Six foot rule system 1. Foot, inch, and fraction of an inch system D. Tie-in between fractional and decimal systems 1. Convert decimal of foot to feet, inches, and fraction of inch 2. Convert inches and fractions of inch to decimals of feet 3. Tie in both systems with percentage system 5. Straight run pipe fitting measurements for screwed, flanged, welded, sweated, bell and spigot, and brazed pipe and fittings A. Pipe data B. Fitting data	1. Freehand drawing A. Basis of useful sketching 1. Lines (horizontal, vertical, angular) 2. Circle 3. Tangents 4. Dimensioning 5. Use of scale, triangles, compass, and protractor, relative to piping drawings B. Geometric applications 1. Geometry and sketching relationships 2. Uses of geometry in sketching 3. Various curved figures C. Principles of projection 1. Methods of representation 2. Working drawings 3. Planes of projection 4. Representation of hidden surfaces 5. Auxiliary views D. Sectional views 1. Representation of interior construction 2. Principle of the sectional view 3. The imaginary cutting plane 4. Kinds of sectional views 5. Exceptions to the rule of sectioning E. Isometric sketchings applied to piping drawings 1. Pictorial representation 2. Principles of isometric drawing 3. Isometric sections 2. Reading construction plans A. Interpreting the plans 1. Floorplan 2. Elevations 3. Sectioning 4. Symbols 5. Conventions 3. Reading piping drawings A. Symbols B. Interpretation of piping arrangement C. Piping construction procedures 4. Piping layouts A. Straight pipe runs B. Offset distances 1. 45 deg. 4. 22½ deg. 2. 60 deg. 5. 11¼ deg. 3. 30 deg. 6. 5⅝ deg. C. Layouts of rolling offsets D. Jennings-Nash high pressure pump layout E. Steam traps F. Pump room layouts G. Boiler connections
2. Control valve and panel 3. Thermal	3. Pressure system 6. Specific heat problems a) Molecular basis of heat	C. Combination of pipe and fitting data for figuring measurements 1. End to end	5. Heating piping layouts A. Piping for steam heating 1. Gravity circulating steam system

2. Dunham
3. High vacuum pump
L. Controls
1. Differential controller and selector

B. Hot water systems
1. Two pipe gravity hot water
2. One pipe forced flow

spigot, and brazed pipe and fittings
A. Pipe data
B. Fitting data

E. Steam traps
F. Pump room layouts
G. Boiler connections

2. Control valve and panel
3. Thermal

3. Steam power
A. Installation and piping for
1. Power boilers
a) Water tube
b) Fire tube
2. Steam power engines
a) Slide valve
b) Corliss valve
c) Compound
d) Uniflow
3. Steam turbines
a) Slide valve
b) Reaction turbine
c) Combined impulse and reaction turbine
4. Feed water heaters
a) Exhaust steam heater
1) Open type
2) Closed type
(a) Atmospheric
(b) Pressure or vacuum
b) Flue gas heater
c) Line steam heaters
1) Open type
2) Closed type
(a) Atmospheric
(b) Pressure or vacuum
5. Superheaters and economizers
6. Condensers
a) Surface condensers
1) Water cooled
2) Air cooled
3) Evaporative
b) Jet condensers
1) Parallel current
(a) Low vacuum
(b) Siphon
(c) Ejector
2) Counter current
(a) Barometric
(b) High vacuum
7. Boiler trimmings
a) Safety valves
1) Spring loaded type
2) Weight and lever valves
b) Fusible plugs and low water fuse alarms
c) Blowoff valves
d) Water columns
8. Pipe line accessories
a) Low pressure check valves
b) Combination back pressure or atmospheric relief valves
c) Steam separators
d) Exhaust heads
e) Expansion joints
9. Boiler controllers
a) Pump governor valves
b) Boiler feed water regulators
c) Generators
10. Pressure reducing valves

3. Pressure system
6. Specific heat problems
a) Molecular basis of heat
b) Properties of water
c) Evaporation and boiling
d) Conversions of temperature and pressure scales
e) Material and energy changes in boilers
1) Types of boilers
f) Molecular basis of pressure
g) Controls
1) Location
2) Purpose and function
h) Relations of temperature, pressure and volume of steam
i) Flow of steam in pipes
j) Variations of main and return loops
7. Vapor heating
A. Applications
B. Function and use of
1. Radiator traps
2. Boiler return traps
3. Air eliminator
4. Automatic boiler water feeder
5. Chimneys and stacks
6. Heating boilers
8. Operation of Webster modulation system of steam heating
A. Vacuum system of heating
B. Jennings vacuum heating pump
C. The function of a lift fitting
9. Operation of a vacuum system of steam heating
A. Dunham subatmospheric steam heating system
B. Dunham vacuum heating pump
C. Differential controller and selector
D. Control valve and panel
10. Operation and function of Illinois selective pressure systems
11. Function of Webster moderator system
12. Jennings-Nash high pressure vacuum pump
13. Selective Pressure Controls
14. Theory and function of hot water systems
A. Hot water problems
B. Two pipe gravity system
C. Reversed return forced flow hot water heating systems
D. One pipe forced flow hot water heating systems
15. Comfort and radiant heat installations
A. Application of thermal radiations to heating systems
B. Selection of pipe for radiant heating
16. Theory of steam power
A. Properties of saturated steam
B. Fuels and combustion
C. Power boilers
D. Engines and turbines
E. Super heaters and economizers
F. Condensers
G. Function, use, and operation of boiler trimmings and pipe line accessories
H. Function of boiler controllers

C. Combination of pipe and fitting data for figuring measurements
1. End to end
2. Center to center
3. Center to end
4. Center to face
5. Face to face
6. Measuring offset pipe runs
A. Length of offsets
1. Length of any set for
a) 45 deg.
b) 22½ deg.
c) 11¼ deg.
d) 5⅝ deg.
e) 30 deg.
f) 60 deg.
2. Length of rolling sets
3. Radiator stub connections
7. General heating calculations
A. Volumes
B. Weights of volumes of liquids
C. Force exerted by fluids in containers
D. Pressure exerted by fluids
E. Atmospheric pressure
F. Buoyancy
G. Nature of fluids and gases in motion
H. Resistance of different carriers
I. Combustion
8. Specific heating calculations
A. Solving by formula
B. Heat transmission
C. Use of coefficients of transmission
D. Infiltration
E. Radiator transmission factors
F. Calculation of use by U factors
G. Graphic representations
H. Pressure head curves for water
I. Pressure head curves for mercury
J. Absolute pressure-temperature curve of saturated steam under vacuum conditions
K. Absolute pressure-temperature curve of saturated steam under low pressure conditions
9. Calculation of heat loss for specific buildings
A. Steam system
1. Sizing pipes
2. Sizing radiators
3. Sizing boilers
4. Sizing pipe line and boiler accessories
5. Controls
B. Hot water systems
1. Sizing pipes
2. Sizing radiators
3. Sizing boilers
4. Sizing pipe line and boiler accessories
5. Controls
10. Steam power calculations
A. Boilers
1. Water tube and fire tube
a) Efficiency
b) Heating surface
c) Builders ratings
d) Grate surface
e) Allowable working pressure
f) Heads for tanks and boilers
1) Dished heads
2) Flat heads and surfaces

5. Heating piping layouts
A. Piping for steam heating
1. Gravity circulating steam system
2. One pipe gravity steam system
3. Illinois vapor heating system
4. Webster modulation system
5. Hartford return loop
6. Typical vacuum system
7. Dunham differential system
8. Illinois selective pressure system
9. Webster moderator system
10. Piping for unit heaters
11. Radiator piping connections
B. Piping for hot water heating systems
1. Two pipe gravity hot water pressure system
2. Two pipe circulating hot water system (forced feed)
3. Two zone one pipe forced flow hot water system
4. Radiator piping connections
C. Radiant heating layouts
6. Steam power piping layouts
A. Piping arrangements for
1. Boiler
2. Boiler trimmings
3. Pumps and pump room layouts
4. Engines and turbines
5. Feed water heaters
6. Pipe line accessories
7. Boiler controllers
8. Condensers
9. Feed water heaters
10. Superheaters and economizers
7. Refrigeration piping
A. Typical refrigeration piping layouts
B. Piping arrangement for various units
C. Graphic representation
1. Graphs
2. Charts
D. Piping for accessories
8. Air conditioning installations
A. Duct systems
B. Fans
C. Grills and registers
D. Piping for air conditioning refrigeration
E. Air conditioning layouts
F. Specifying equipment
9. Welding drawing
A. Template layouts
1. 90 deg. turn
2. 45 deg. turn
3. Template layout for given angle
4. Special turns
5. 60 deg. Y turn
6. Orange peel head
7. Concentric reducer
8. Branch connections — 90 deg. — unequal diameter
9. welded pipe header layout
10. Template for pipe cutting curves
10. Interpretation of specifications and contracts
A. Public laws
B. Codes

Job processes	RELATED INSTRUCTION		
	Related shop theory	Related shop mathematics	Related shop drawing
4. Installation and piping for refrigeration machines and systems A. Installation and piping for 1. Refrigerating systems *a*) Domestic *b*) Commercial *c*) Refrigeration for air conditioning and comfort cooling *d*) Industrial refrigeration *e*) Refrigeration for ice making and cold storage 2. Condensing unit *a*) Compressor *b*) Condenser *c*) Motor 3. Commercial evaporators *a*) Fin coils *b*) Flooded evaporators *c*) Unit coolers 4. Accessories *a*) Water regulating valve *b*) Pressure control valve *c*) Automatic switches *d*) Thermostats *e*) Flow indicators *f*) Liquid line strainer and sight glass *g*) Dehydrators *h*) Safety valves *i*) Valves 5. Charging and testing *a*) Apparatus and pipe lines 1) Pressure 2) Vacuum *b*) Freon machines 1) Use of Halide torch *c*) Ammonia systems *d*) General 1) Carbon dioxide 2) Ammonia 3) Freon 4) Methyl chloride 5) Sulphur dioxide 6) Methylene chloride	I. Operation of pressure reducing valves J. A study of elementary steam power plants **17.** Principles of refrigeration A. Fundamental processes 1. Kinetic and radiant heat 2. Measurement of heat 3. Conduction and convection 4. Forms of heat 5. Force and energy 6. Elementary electrical theory 7. Power 8. Graphic representation 9. Pressure 10. Gas laws 11. Physical equilibrium in refrigerants B. Function and operation of refrigeration systems 1. Domestic refrigeration 2. Commercial refrigeration 3. Refrigeration for air conditioning and comfort cooling 4. Industrial refrigeration 5. Refrigeration for ice making and cold storage **18.** Operation and function of air conditioning systems A. Glossary of terms B. Functions of air conditioning systems 1. Ventilating 2. Heating 3. Cooling 4. Humidifying 5. Cleaning C. Types and construction of air conditioning systems 1. Direct system 2. Closed indirect 3. Open-indirect 4. Closed-indirect vented 5. Water cooled D. Seasonal use E. Composition of air F. Properties of air G. Use of psychometric chart 1. Dry bulb 2. Wet bulb H. Use of reference charts I. Temperature and comfort relationships J. Determination of load 1. Heat gain data K. Theory of heat transmission L. Air mixtures M. Direct systems 1. Central systems 2. Unit systems N. Types and use of fans 1. Centrifugal type *a*) With forward curved blade *b*) With backward curved blade *c*) Radial tipped blade	2. Steam boiler determinations *a*) Ratings for 1) Dry saturated steam 2) Wet steam 3) Superheated steam *b*) Equivalent evaporation in pounds of water B. Calculations for expansion loops 1. Use of tables C. Determining the size of 1. Capacity of engines and turbines 2. Condensers 3. Boiler trimmings 4. Pipe line accessories 5. Boiler controllers 6. Pump governors 7. Valves **11.** Refrigeration determinations A. Capacity ratings for refrigerating units B. Measurement of heat C. Use of tables for 1. Latent heat 2. Specific heat D. Heat loss calculations E. Determining the capacity of the condensing unit F. Heat transfer in evaporators G. Pipe coil capacities H. Calculation of effective surface of finned evaporators 1. Prime area 2. Fin area I. Heat loss in refrigerators J. Installation specifications and calculations K. Allowable velocities through pipe lines L. Test pressure tables M. Graphic representation N. Pressure calculations O. Dimensional formulae tables 1. Length 11. Momentum 2. Time 12. Acceleration 3. Mass 13. Pressure 4. Temperature 14. Force 5. Area 15. Work 6. Volume 16. Power 7. Density 17. Heat 8. Specific vol. 18. Specific heat 9. Speed 19. Thermal capacity 10. Velocity 20. Entrophy P. Use of thermodynamic tables 1. Saturated ammonia — pressure 2. Saturated ammonia — temperature 3. Freon — temperature 4. Methyl chloride — temperature 5. Sulphur dioxide Q. Determining the quantity of refrigeration R. Use of Mollier diagrams **12.** Air conditioning calculations A. Boyles law application	**11.** Estimating for piping and equipment installation A. Material B. Labor C. Overhead D. Contingencies
5. Installation and piping for air conditioning equipment A. Installation of air conditioning systems 1. Direct systems 2. Closed-indirect systems 3. Open-indirect systems 4. Closed-indirect system — vented 5. Water cooled systems B. Compressors 1. Reciprocating type 2. Centrifugal type 3. Thermal or steam jet C. Condensers D. Evaporators 1. Indirect 2. Direct E. Spray water piping			
F. Indirect heating systems G. Temperature controls	O. Grills and registers P. Filters	B. Charles law application C. Daltons law of gases	

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2. Direct
E. Spray water piping
1. Centrifugal type
a) With forward curved blade
b) With backward curved blade
c) Radial tipped blade
Q. Determining the quantity of refrigeration
R. Use of Mollier diagrams
12. Air conditioning calculations
A. Boyles law application

F. Indirect heating systems
G. Temperature controls
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b) Paint spraying
c) Air conduction
d) Gas flow
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f) Steam jackets
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h) Sterilizers
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D. Hangers
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1. Reciprocating
a) Single acting
b) Double acting
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3. Rotary
a) Vane c) Syclodial
b) Eccentric
4. Jet
a) Ejector
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1. Stab welding
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(*Concluded in next column*)

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H. Air volume
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Toolholders—Their Design, Construction, and Location on the Tool Panel

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There is always need for improvement in shop organization and special emphasis should be placed on tool storage and types of toolholders used. Organization and management are just as important in the shop or laboratory as in industry itself. Most authors deal with the subject of toolholders as a secondary matter in the organization of the tool panel. However, all persons connected with industrial arts know that tools are easily lost, stolen, or damaged. Inadequate holders allow the tools to fall resulting in breakage, dulling, and possible injury to the pupil.

Every tool should have a definite and conspicuous place in order to promote efficiency. Tools placed in the wrong position result in loss of pupil and instructor time which in turn tends to lower the class morale. Some instructors still prefer a toolroom where one boy stands at the window and issues all the tools. This method, however, produces much lost time, and piling the tools one on top of another at the window results in damage or misplacement.

Lawrence A. Hill (3, page 51)[1] in his thesis, *Time Efficiency Analysis of Industrial Arts Tool Systems,* found the open tool panel the most effective. He found however that a great deal of time was lost by not having the proper type of toolholders.

Emanuel E. Erickson (2, page 122) makes the following statement as one of the reasons for teacher failure, "One reason for a great number of failures in shop teaching is, without question, lack of conscious organization. To the beginning teacher, and to many others as may need it, may be given with great emphasis, the advice, *organize your shop.*" Mr. Erickson considers organization of the tool panel and the type of holders used as a major problem.

J. S. Turnbull (7, page 265) also makes a statement concerning tools and the tool panel: "An open panel lessens delay and confusion. Tools are not subject to as much breakage and wear as when they are passed through a toolroom window or where they are piled on a window shelf."

In the search for materials that might already be available it was discovered that toolholders and related problems of tool storage such as, toolrooms, tool panels, tool cabinets, and tool kits, offered a wide range and as material was accumulated, it became apparent that the problem was too large and limitations had to be made as to just what would be included in this study. For this reason this study was limited only to "Toolholders — Their Design, Construction, and Location on the Tool Panel."

The Principal Method Used

Photography was chosen as the principal means of assimilating this material for the following reasons: (1) More information could be gathered in a comparatively short time. Whole panels or sections of panels could be photographed and the individual toolholders thereon could be compared with those appearing in other photos. (2) Photographs are accurate and show the true situation pertaining to desirability of design, proper location, selection of material from which they were made and, in some cases, how well they withstand usage. (3) A photograph records and clarifies far more information than would be possible by manuscripts and drawings.

Criteria

It is necessary to have some means of evaluating the organization of tool panels and design of toolholders. The following criteria are proposed as a means of judging the convenience and efficiency of individual toolholders:

1. Place tools that are used most frequently in the most accessible positions.
2. Group tools so that the tools used in one activity are together.
3. Arrange holders so that no tool or tools will have to be removed in order to secure another tool.
4. Arrange racks so that no element of danger will be incurred in removing the tool wanted.
5. Sharp points and cutting edges should be covered or protected so that edges cannot be dulled or tools damaged while in the storage rack.
6. Conserve as much space as possible without overcrowding.
7. Arrange the position of the holder so that the tool will not have to be shifted in order to remove from the holder.
8. Arrange tools so that they can be placed only in one position when they are replaced.
9. Proper identification of tool location hastens the return of the tool to the panel.
10. Arrange tools so that the general appearance will be neat and attractive.
11. The tool should fit easily in its holder. Avoid holders which require pulling or twisting of the tool.
12. Construct toolholders of hardwood, metal or a combination of metal and wood. Use hardwood only for cutting, boring, and scraping tools.
13. Panels and toolholders should be finished (painted or varnished) so as to appear neat and attractive and make the absence of a tool conspicuous.
14. Separate tool racks should be provided for each tool so that a blank space indicates a missing tool.
15. Spaces for tools loaned out should be indicated by a printed cardboard "loan tag" which shows where the tool belongs when it is returned.
16. Spaces for tools which have been lost and which cannot be replaced immediately should be indicated by a *red* cardboard "lost" tag.

Critical Analysis of Fifty Photographs

A critical analysis of each of the following fifty photographs is given as a means of helping those interested in the problem

[1]Refers to a reference in the bibliography and to a definite page.

to interpret and study these photographs. Some pictures are shown for their comparison value in clarifying the *should not* side of this problem. Others show the logical steps taken in improving existing toolholders. In several cases the same design, with slight modifications, is applied to more than one tool. The photographs are classified into four general groups which are: (1) Tool Panels. (2) Woodworking Tools. (3) General Metal Tools. (4) Racks.

Summary

A review of literature brought out the importance of toolholders but made little effort to remedy the situation by compiling a list of working drawings or photographs. A statement of criteria was established in regard to special holders for the various tools and these criteria were applied to a critical analysis of the photographs. The photographs showed laxity of organization, efficiency, safety, adaptability, and appearance of tool panels and toolholders used in suspending tools from the panel. They also showed a number of toolholders which were very satisfactory according to the criteria used.

Use of the Study

This study may be used as a source of information for new ideas and design of holders for hand tools. It will give the individual a foundation and basis for creating new designs and judgment in the arrangement and organization of tools on the panel. It is hoped this study will furnish an incentive for improvement of toolholders: their design, construction, and location on the tool panel.

Suggestions for Further Study

In making this study the following problems arose: (1) Selection and number of tools to be placed on a panel and those to be used as individual equipment. Any number of shops fail to give this much consideration, and as a result there is an oversupply in some tools and a shortage in others. (2) Storage and issue of supplies. Poorly organized storage facilities, such as racks and holders, and methods of issuing supplies create a serious leak in the shop or departmental budget.

Conclusions

Much has been written on shop organization but there have been no books or pamphlets and very few magazine articles written on this particular problem. More contributions are needed. A compilation of toolholders published in book form for the use of shop teachers would be a welcome addition to the material now available on shop organization.

Appendix A

The following references found in the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine show pictures and drawings pertaining to this problem.

Woodwork

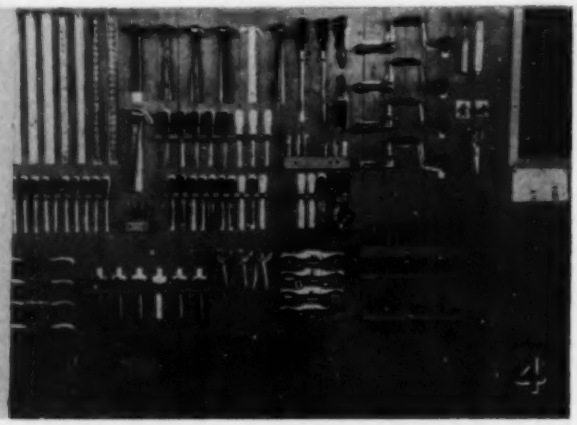
1. 22:353, Nov., 1933, "Cold Glue and Brush Container."
2. 22:177, Apr., 1933, "Short Length Lumber Rack."
3. 23:384, Dec., 1934, "Brad Box."
4. 23:265, Aug., 1934, "Open Tool Panel."
5. 24:97, Mar., 1935, "Band Saw Rack."
6. 25:132, Apr., 1936, "Bench Tool Holder."
7. 25:324, Oct., 1936, "Combination Bar Clamp Rack and Glue Table."
8. 25:127, Apr., 1936, "Tool Hardware Cabinet."
9. 26:254, Aug., 1937, "Bench Toolholder."
10. 28:382, Nov., 1939, "Visible Auger Bit Rack."
11. 30:442, Dec., 1941, "Simplifying Tool Checking by the Use of Tool Kits."
12. 30:406, Nov., 1941, "Wood Lathe Tool Kit on Wheels."
13. 30:401, Nov., 1941, "Wood Lathe Panel."
14. 31:365, Nov., 1942, "A Program for Conserving Shop Tools and Equipment."
15. 31:366, Nov., 1942, "Tool Panel Arrangement."
16. 31:389, Nov., 1942, "Useful Tool Panels."
17. 32:354, Oct., 1943, "A Plywood Rack."
18. 32:351, Oct., 1943, "Portable Lathe Toolholder."
19. 33:388, Nov., 1944, "Lumber Display Panel."
20. 33:160, Apr., 1944, "Checking Tools by Color."
21. 33:274, Sept., 1944, "Tool Storage: A Place for Everything and Everything in Its Place."

Figure 1 shows a tool panel that was built in the writer's shop in Oklahoma City prior to the preparation of this report.

Tools which are not used very often are arranged on shelves in the cabinet below the tool panel. All holders are constructed from hardwood with the exception of that for the spokeshaves, which is made from metal. Tools do not stand out as well as they should because the panel and toolholders are too dark. The file rack should be lowered as the hammer handles interfere in getting the files. Chisel points should be protected. Gimlet, screw driver, and countersink bit holders could be improved by making them on the same order as that for the auger bits.

Figure 2 shows a tool panel which for obvious reasons cannot be identified. It speaks for itself. Very few panels are as bad as this one and the principal reason for showing it is as a reminder that there is always room for improvement.

Tool panels as well as tools need repairs now and then, even though it might be only a coat of paint. Tools on this board had been badly mistreated and were in need of repair or replacement. *The incentive to care for tools is proportionate to the appearance and organization of the tool panel.*



The tools on the panel in Figure 3 are poorly arranged and take up too much space. Handsaws should be placed low on the panel and encased so as to protect the teeth. There is danger of injury from exposed cutting edges of chisels. The claw hammer holder is good. Holders should be designed so tools would not have to be raised their full length as is the case of marking gauges and try squares. The space required for the braces is entirely out of proportion to the amount needed. Ledge should not be available for the storage of scraps, odd tools, etc., as is the case of the tops of these tool racks.

Figure 4. Silhouetting of the tools is a good idea but the manner in which they are suspended from the tool panel is bad. In most cases hooks are used and the tools take up too much space. The cutting edge of each of the chisels is exposed and some of the tools have to be lifted their full length to be removed.

When plywood is available, there is no reason for using ceiling or flooring for the back board of the tool panel. A ¾-in. plywood board with a framed edge is probably the most suitable form for the backboard. Note the blackboard which may be used to designate lost or missing tools.

On the toolboard shown in Figure 5 hooks are used almost throughout and there is no way of identifying where the tool belongs once it has been removed. The cutting edge of the drawknife is exposed. A holder which requires the use of a turnbutton, such as the hack saw and others, is not desirable on a tool panel. The bit rack protects the point of the auger bits but is somewhat extravagant of space. There is no way to tell how many framing squares belong on this board.

The use of the combination tool locker and open panel in Figure 6 is good. The hammer rack could be improved by adding a support for the handles to keep them straight. Because of its dark finish, tools do not stand out well on the panel. The arrangement is good and the tools are well grouped.

The chisel holders on the panel in Figure 7 are good but they should be made to accommodate the longest as well as the shortest in order to protect all the cutting edges. Counter brushes should be kept at the area in which they are used. Mallets could conserve half the space by laying them on the shelf.

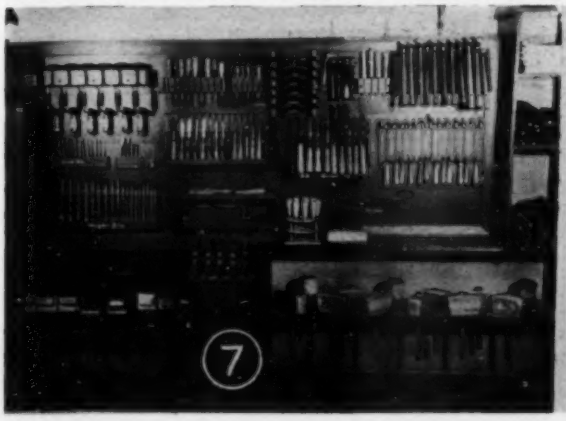
The panel shown in Figure 8 is in the process of being remodeled. Previously all tools were held by hooks as is shown in panel *A*, and both panels were filled with the tools shown. Panel *B* will hold all the tools and not be overcrowded, thus saving a great deal of space.

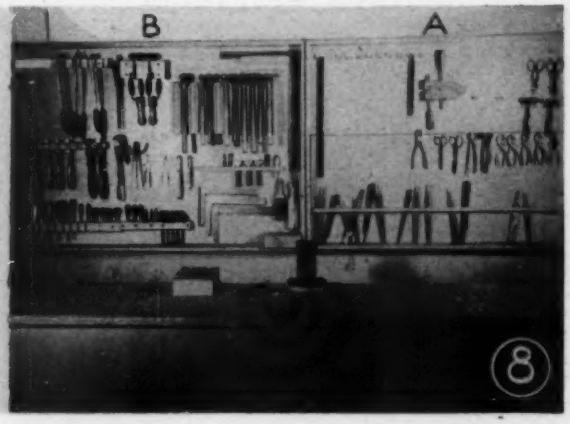
The panel in Figure 9 shows compactness and organization. However, the use of screw hooks in holding some of the tools detracts from it. Also the drawknife blade should be covered. A notch for the handle of each hammer in the hammer rack would keep them straight.

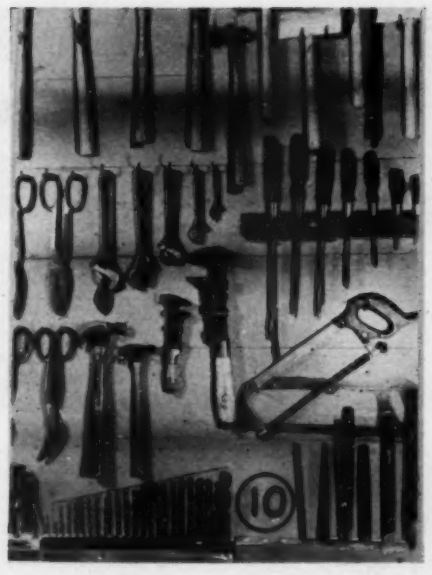
The tools on the panel in Figure 10 are scattered and disorganized. Silhouettes are not effective due to poor organization and the lack of toolholders.

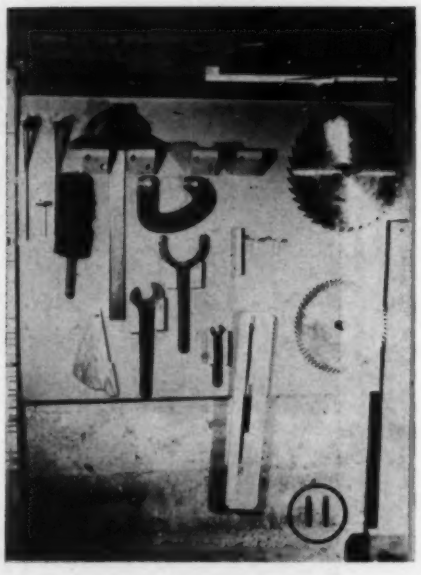
Special panels for machines, such as the one shown in Figure 11, should be located near the machines. The circular saw blades should be enclosed for the protection of the teeth. A system of pigeon holes large enough to accommodate one saw each, with special provision for a dado head would be an improvement over this method.

The movable panel shown in Figure 12 is poorly organized and takes up a lot of space for the amount of tools and equipment mounted upon it. A tool locker located near the lathes would be more efficient and would save the time taken in pushing this panel from the toolroom to the area where it is used and back again. On the other hand, the idea of a portable tool panel is good. In this case it is especially good since it is low enough so it







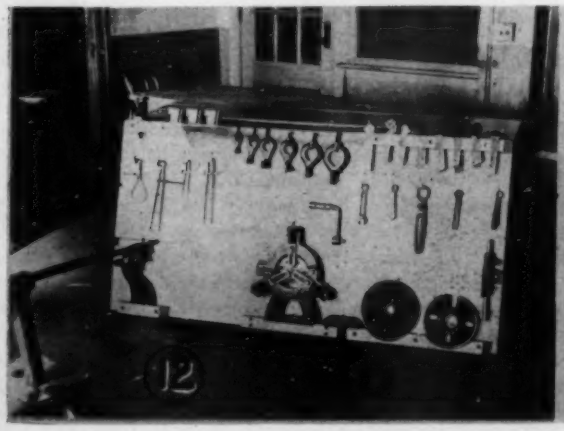


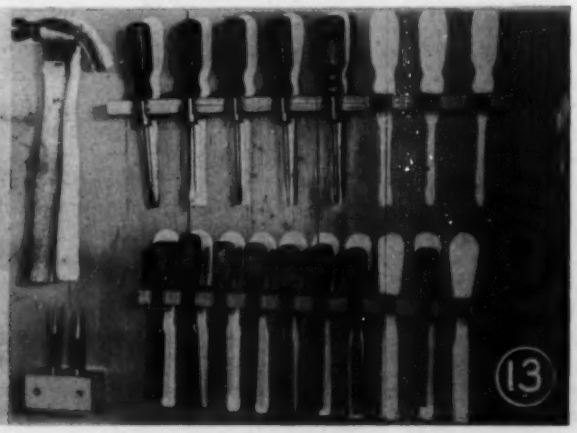
does not obstruct a view across the shop, and both sides of the panel are used for tool storage.

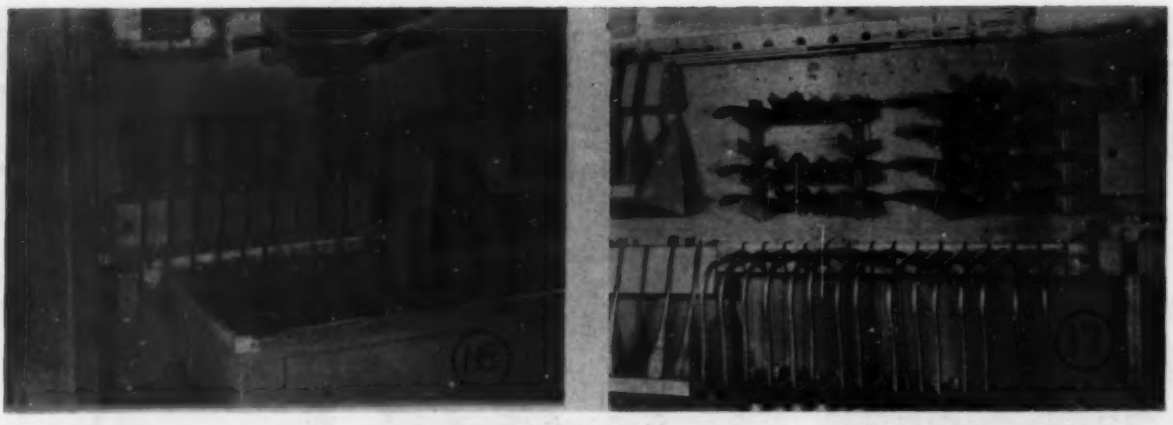
The silhouetting on the panel in Figure 13 is good. The tools are held straight and are easy to remove. The screw drivers could be closer together and the cutting edge of chisels should not be exposed.

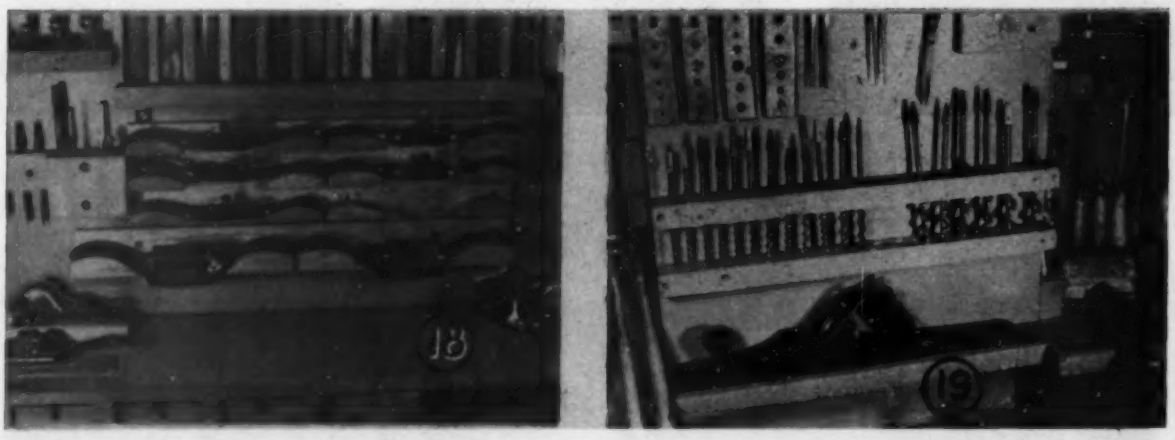
The tools on the panel in Figure 14 are poorly arranged and crowded. It would be better if the chisel rack were above, below, or to one side of the screw drivers. Chisels have to be lifted their full length to be removed and the cutting edges are not protected.

Figure 15 shows a good rack for chisels provided it is made to accommodate the longest as well as the shortest chisel. It should be









made so the chisels form at least a 30-deg. angle with the face of the panel.

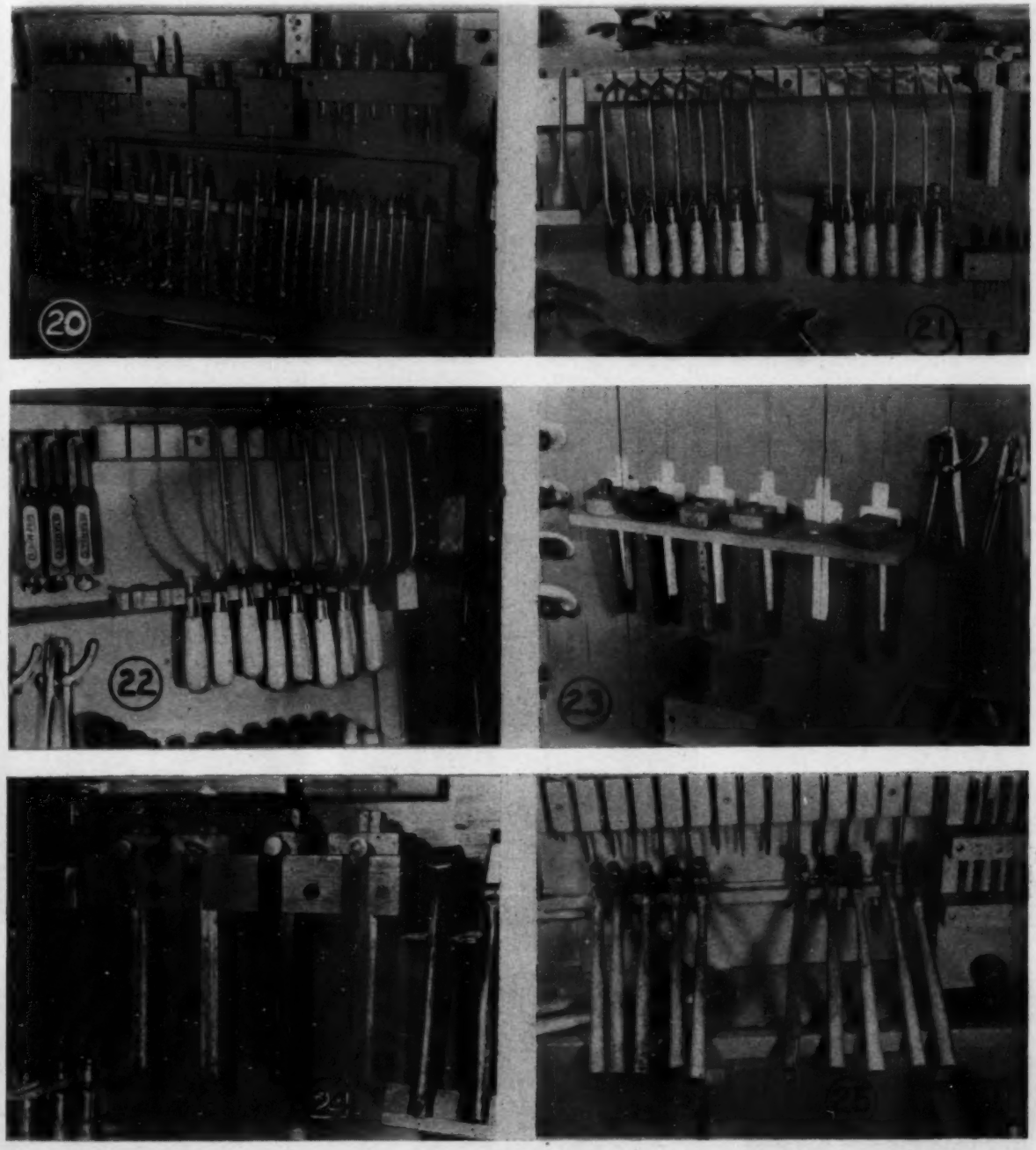
The screw-driver holder in Figure 16 is good but its location, or arrangement of the screw drivers should be changed. It should have been made so the large screw driver would fit in the left hand socket instead of boring a hole through the locker top.

The spokeshave holder in Figure 17 is sturdy and holds the tools straight. However, they can be returned to the holder in a reversed or upside down position. The same is true of the cabinet scraper holder in Figure 16. The chisel rack is good but would be improved by making the upper part wide enough to protect the cutting edges of the chisels.

The spokeshave and cabinet scraper holder in Figure 18 seems to meet all the requirements. The holder is sturdy and neat in appearance. Tools are compact, straight, and are held only in one position. The absence of a tool is readily noticeable. The file holder is good because a separate compartment is provided for each file. The files are held straight and must be lifted half their length protected.

The auger bits in Figure 19 are not held straight and must be lifted half their length before removing. There is danger of injury on the scissors and divider points. These should be in a holder designed to protect the individual as well as the tool.

The auger bits in Figure 20 are held straight, are easy to remove and are easily returned to their correct place by the size



hole and number stamped at the base of the holder. Lips and feed screws are protected. The design of the gimlet, screw driver, and countersink holders should be patterned after that of the auger bits.

The coping saw rack in Figure 21 is compact but the saws are not crowded, and they may be removed easily. Silhouettes or contrasting colors cannot be used very effectively for identification purposes with this toolholder. A neat sign designating the tool and the number of tools is sometimes used. Example: Coping Saws — 15.

Figure 22 shows the same type of holder as in Figure 21, with the addition of a handle rest. The saws are held perfectly straight and are easier to remove because the frame has no tendency to bind in the upper part of the holder. The saw teeth are not protected, however.

The marking gauges in Figure 23 have to be lifted their full length before they can be removed from the panel. They can be returned in more than one position and the setscrew is not always visible. The tool cannot be checked quickly for missing parts.

Silhouettes could be used for quick identification on the toolholder shown in Figure 24. This holder is so designed and spaced that the marking gauges are held only as shown in the photograph. Setscrews cannot be turned any other way. The tool is easily removed and replaced.

The hammers in Figure 25 can be replaced in more than one position and the handles are not held straight. A series of notches in the handle are not held straight. A series of notches in the handle support would help to solve that problem. They are poorly located

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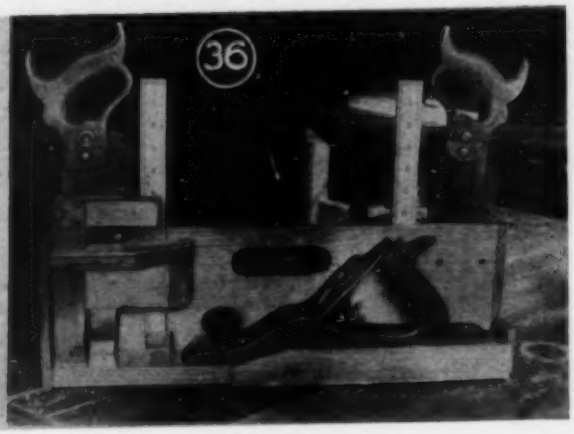
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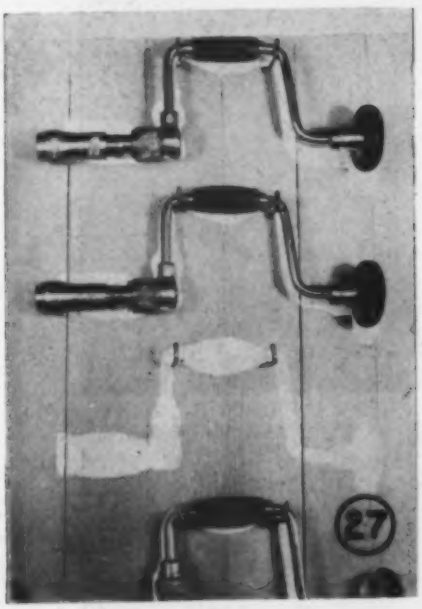
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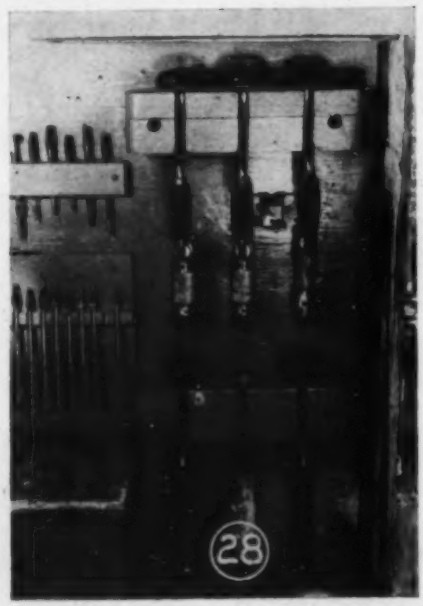
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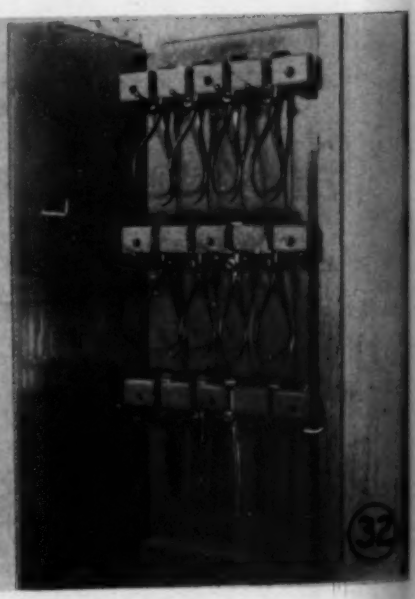
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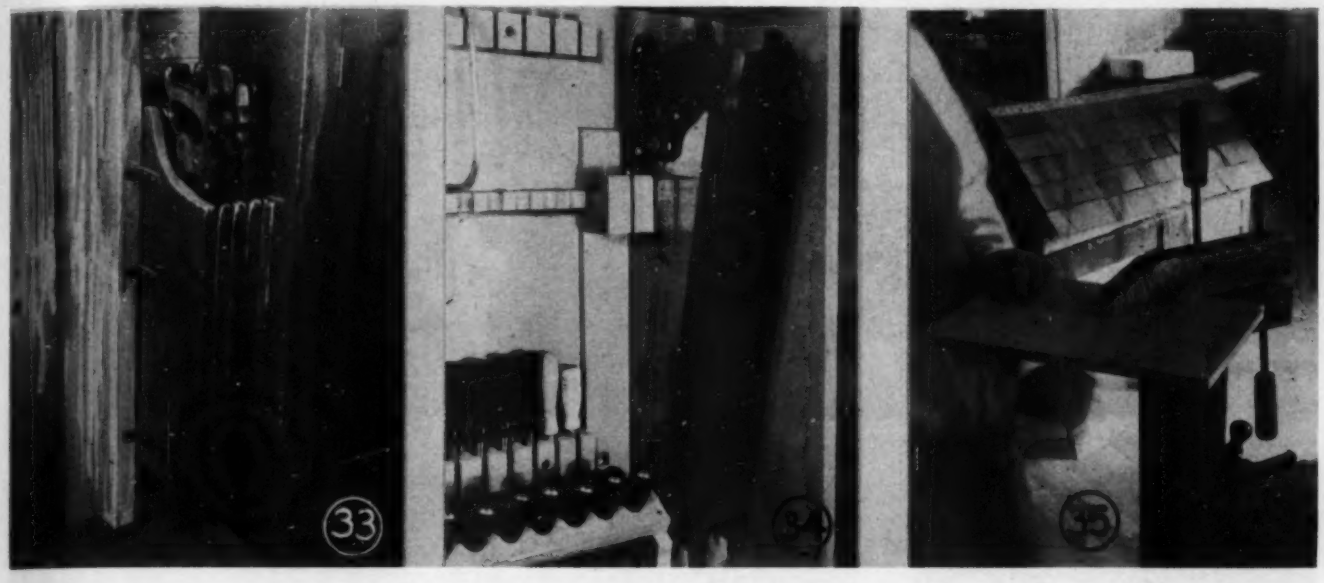


because they cover a portion of the shelf that is used to store other tools or articles.

In the rack in Figure 26 the hammers can be held by the face or by the claw, which is not desirable. The holder could be made wider and holes bored along the top edge, slightly larger and to accommodate the face of the hammer. Tools in this area of the panel are slightly crowded, especially the file and hammer racks. The design of the other holders is good. That for the pliers is made from a combination of band iron and wood.

The braces in Figure 27 can and usually are replaced in more than one position. This detracts from the appearance of the panel. Too much space is taken up and hooks are not desirable as a means of holding tools to the panel. The silhouettes are carelessly made.

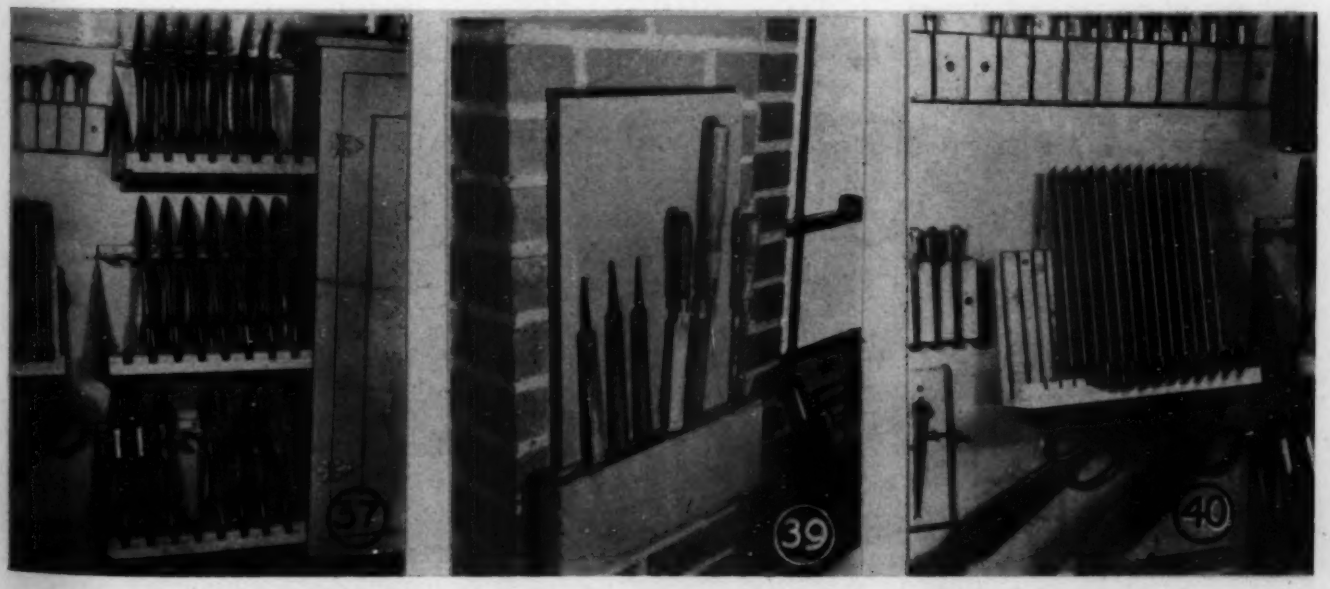
The braces in Figure 28 are held straight and take up very little space. They are easily removed, and can be replaced in only one position. The use of a printed sign designating the tool and number of tools could be used.

Figure 29 shows an individual wood-turning lathe tool panel. The cutting edges are protected and various tools are easily identified. The lathes are placed at right angles, with the tailstock next to the wall and the tools are conveniently located. This method is satisfactory for a shop with one or two lathes; otherwise the tools would be scattered over too large an area for easy checking.

In the installation, shown in Figure 30, the lathe tools are kept in a drawer holder and when in use fit in a rack on the lathe. The bottom of this drawer should be completely covered as short tools fall through. This cabinet should have been completed to hold faceplates and various other lathe accessories. A disadvantage is that the tools cannot be easily checked. An improvement would be to encase the drawers in a stair step arrangement so the cutting edges of the tools in each drawer could be seen.

The scraper holder in Figure 31 is weak in construction and will not keep the scrapers in vertical alignment. A much better holder is shown in Figure 26, although this one could be improved still more by making the saw cuts in a solid block of wood slightly longer than the scraper, thus enclosing the ends.

The calipers in Figure 32 are easily removed, and they can be replaced in only one position. Besides this, they are held straight and



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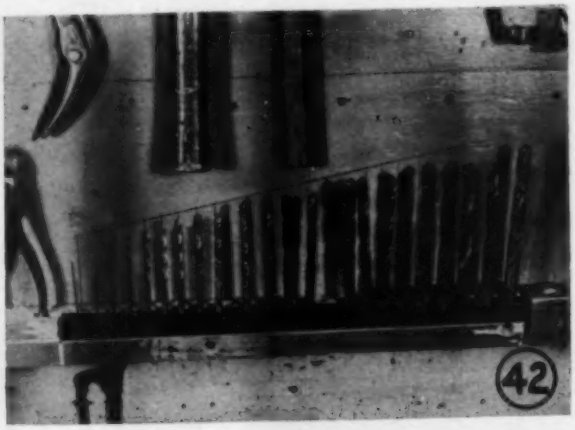
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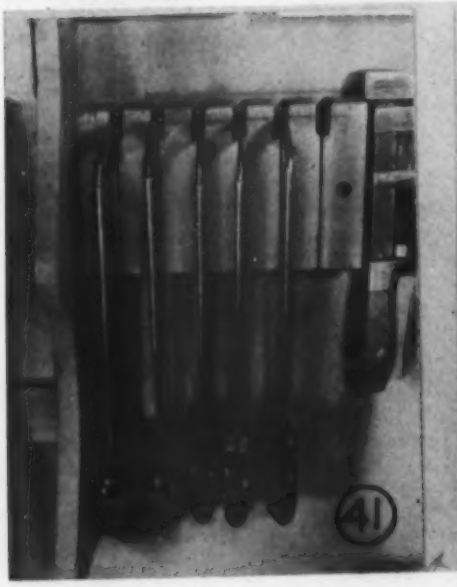
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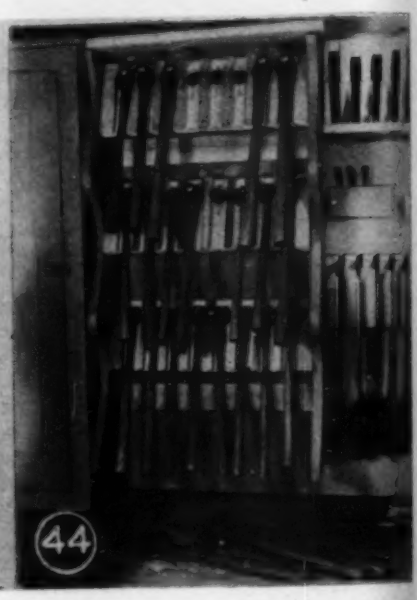
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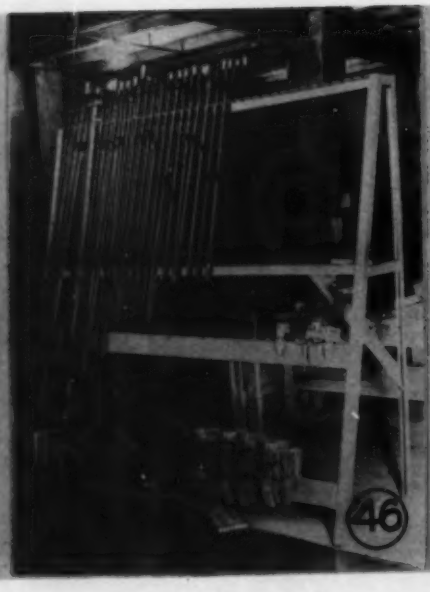
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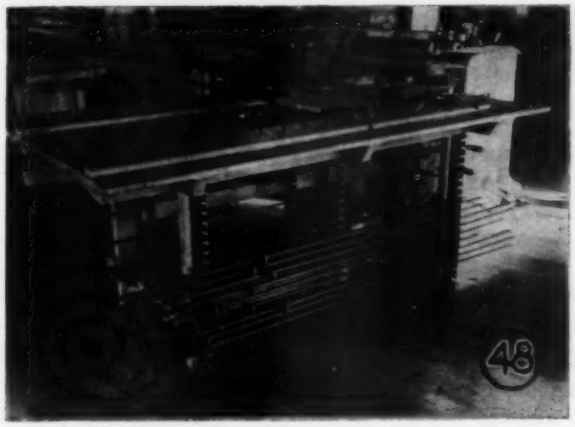


do not take up much room. A printed sign should be used to identify the tool and number of tools.

Figure 33 shows the result of saws being replaced in more than one position. More space should be allowed between saws as a protective measure and also to facilitate easy handling.

The saws in Figure 34 can be replaced in only one position. This is a big improvement over that shown in Figure 33. There should, however, be more space between the handles, and the left end of the holder should be enclosed so as to give the saws more protection. This holder should be located close to the floor as is shown in Figure 33. The saw teeth must be protected from damage and must be covered for safety.

Figure 35 shows a hand screw clamp which is converted into a vise for holding coping saw work. The vertical position is adjustable according to the height of the individual. The board is easily changed to a new working position and is held firmly in place. Flexibility of positions makes this clamp extremely useful for a number of operations in the shop.

The portable bench toolholder in Figure 36 shows a design for double benches and contains those tools which all students commonly use every day. The bench top may be cleared for layout and assembly of large problems and the tools are easily checked. The heel of the plane rests on a thin wood block which is a protective measure for the plane bit.

The tin snip holder in Figure 37 is made from a combination of wood, sheet metal, and band iron, and meets most of the requirements of a good holder. It is neat in appearance, the snips are held straight, are easy to remove, and the absence of one is easily detected. A silhouette for each kind of snips could be painted against the respective holders for ease in identification and proper replacement.

The soldering copper support in Figure 38 should also support the handles at the base. They should be tilted away from the panel at about 30 deg. A good holder is one similar to that for the tin snips shown in Figure 37. Instead of slots, holes should be bored to serve as sockets for the soldering copper handles.

Files are some of the most abused tools in the shop. This is partly due to the design of their holders. A holder of the design shown in Figure 39 is satisfactory provided the slot fits the file. Another design is found in Figure 26.

Figure 40 shows a good holder for steel squares. It meets all the requirements listed in the criteria for a good toolholder.

The hack saws in Figure 41 are held straight, take up very little room, can be replaced in only one position, and the absence of one is readily detected.

The twist drill holder shown in Figure 42 is made of a combination of angle iron and hardwood. The sizes of the drills are stamped on the metal and each drill fits in a hole the exact size of the shank which is a further aid in identification.

Scratch awls and divider points are not exposed in the holders shown in Figure 43. This is a worth-while safety precaution. The tools are easily removed. They are held in a uniform manner, and can be quickly checked.

The ball-peen hammer rack in Figure 44 could be improved by the addition of a handle support with cleats or grooves to fit the handle and thus hold the hammer straight. A good holder for cold chisels is shown in the upper right hand corner.

The bar clamp rack in Figure 45 presents a safety problem because the clamps can fall off. Metal supports were added later, which held the clamps at an angle as is shown in Figure 46. This clamp rack is a good example of conserving floor space and utilizing wall space.

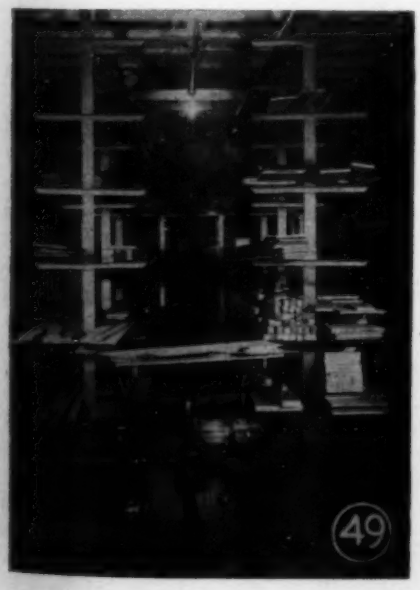
Figure 46 shows a bar clamp rack which was developed from the one shown in Figure 45. It takes up no more space and has the advantage of being movable.

The band screw clamp rack shown in Figure 47 conserves space and holds quite a number of clamps. It is not rigid enough and should be made of heavier material.

Figure 48 shows a combination table which is practical in design. Provision is made for various lengths of clamps. They may be removed easily, and there is no danger of their falling. The angle iron clamp support on top of the bench is a very nice feature in connection with the gluing of stock.

The lumber rack in Figure 49 is so designed and spaced as to hold a wide variety of lumber of all kinds and sizes. The aisle between the two racks is spaced so that long lumber can be fed through the saw. A rack for short length lumber is at the back, and shelves have the same spacing as brackets on the long length racks.

Figure 50 shows a vertical rack for band iron. A horizontal rack is more satisfactory if space permits.



Significant Truths and Unfortunate Consequences

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We constantly strive for the truth and after finding what we believe to be the truth we must continue to re-examine our data and seek new sources and new data in order to be aware of important changes.

I have prepared this article rather reluctantly, yet with a genuine feeling of sincerity that the observations presented should be brought out into the open, and thus have the issues faced squarely by everyone interested.

It is true that only a comparatively small per cent of school administrators today have had either any training or teaching experience in any type of industrial education. Their teacher training and teaching experience has been largely in academic subjects.

The unfortunate consequence of this situation is a lack of interest and understanding of industrial education among many school administrators. With the growing importance of industrial education in our industrial age this is indeed unfortunate.

It is encouraging to note, however, that more capable men with training and experience in industrial education are entering the field of school administration.

Industrial Arts and the Class Schedule

It is true that industrial-vocational programs do require an unusual and different class schedule. A half day is required for the class.

The unfortunate consequence is that this requirement in some cases has been permitted to interfere with the efficient operation of the school. Careful attention must always be given to class schedules, but there is no reason for requirements for industrial-vocational classes to interfere with the scheduling of classes for other pupils in other subjects.

It is true that there has been some ill-feeling between teachers and leaders in industrial-arts education and industrial-vocational education.

The unfortunate consequence has been confusion and misunderstanding in both major areas or divisions of industrial education. It is difficult if not impossible to locate the specific cause of this unfortunate situation. I am convinced, however, that it is largely professional in nature although personalities may be involved in some cases. It is beyond a doubt, more serious than we want to believe. It has created a slight breach in the professional ranks of those interested in industrial education, which prevents us from developing a strong unified program.

Industrial-Arts Programs Frequently Lack Supervision

It is true that directors of vocational education who are responsible for both industrial-arts education and industrial-vocational education too often give more time and attention to the vocational program than they give to the industrial-arts program.

The unfortunate consequence, of course, is that the industrial-arts program must suffer. I am firmly convinced however, that this *professional slight* is neither deliberate nor intentional, since there is no real justifiable reason for this situation. The industrial-arts program needs supervision and direction often more than the industrial-vocational program.

It is true that there is an important fundamental, basic, and philosophical relationship between industrial-arts education and industrial-vocational education.

The unfortunate consequence has been that this relationship has not been recognized by some people. The relationship is both complimentary and supplementary. They are not in conflict with each other as some believe. It is rather generally conceded that a good industrial-arts program is essential for a good industrial-vocational program. I heard one industrial-arts leader speak of the "Rape of Industrial Arts" by industrial-vocational education. It is, of course, unfortunate that anyone would ever make such an unjust statement.

It is true that there is a difference between industrial-arts education and industrial-vocational education. The unfortunate consequence, however, is that we tend to emphasize these differences and minimize the many ways in which they are alike. So much could be gained if we could only give more attention to the ways in which they are alike.

It is true that teachers of industrial-arts education too often seem to have very little interest in industrial-vocational education. The same charge, however, might be made against teachers of industrial-vocational education.

The unfortunate consequence is that this lack of understanding and indifference on the part of the teachers in these two areas toward the work of the other man is selfish and self-centered to say the least. Co-operation, resulting from efforts to work together, would strengthen our total program in industrial education.

It is true that industrial arts is offered chiefly for its general education value, yet it must be admitted that many industrial-arts programs have considerable vocational significance.

The unfortunate consequence is that industrial-arts teachers often refuse to admit that their work has vocational significance, and the vocational teachers will not recognize the extent to which vocational objectives are achieved in industrial arts.

Terminology Adds Further Misunderstanding

It is true that the terminology used becomes a factor in creating a clear understanding of the vocational and prevoca-

tional phases of our program in industrial education.

We find both the vocational and general education programs in home economics and agriculture. In each case however, each type is referred to as home economics or agriculture.

In industrial-education, however, the general education phase of the program is called industrial-arts education while the vocational phase is called industrial-vocational education or as many prefer to call it, trade and industrial education.

The unfortunate consequence of this situation results in confusion and beyond a doubt makes our program more difficult to understand.

It is true that there is a considerable difference in the teaching assignments for teachers of industrial-arts education and teachers of industrial-vocational education. For example, a vocational teacher will likely have 15 to 18 students in each of two, three-hour classes. The industrial-arts teacher will usually have 5 or 6 classes with an average of 20 or even more in each class.

Although the difference may not be as great as the figures might indicate, the unfortunate consequence has resulted in creating some professional jealousy between teachers in the two areas of industrial education.

It is true that there is an estimated 6000 industrial-vocational education shops and 40,000 industrial-arts education shops in the United States today. The supervision provided the vocational program however, is far more extensive and far superior in every respect to that provided for industrial arts.

The unfortunate consequence is that a considerable amount of the poor instruction found in industrial-arts could be improved and eliminated with adequate supervision.

No effort has been made to provide an exhaustive treatment of this subject. The items included, however, seem to me to be rather significant among all that might be listed.

A City Industrial-Arts Supervisor Looks at Professional Organizations

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Los Angeles City Schools
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Perhaps the first reaction of the city industrial-arts supervisor to professional organizations is "how can they help improve instruction in the school shop and classroom?" As he examines the functions of the organizations on national, state, and local levels he soon discovers that the functions of these groups are much broader in scope than the mere improvement of instruction, as important as that may be.

First, it might be well to enumerate a few of the functions and benefits of a local industrial-arts organization:

Participation in Organization Affairs

1. Participation in a local professional organization establishes a teacher-supervisor rapport which is so necessary to progress in a large city system.

2. It gives opportunity for many teachers to participate in meetings where new techniques of teaching, new instructional materials, new processes, and new industrial materials are presented and shared by all.

3. It offers an agency through which the school administrator and supervisor may introduce the educational point of view and policies of the school system.

4. It provides an outlet for teacher complaints, constructive criticisms, and suggestions for improvement.

5. It develops as esprit de corps through fellowship and co-operative accomplishment.

6. It establishes the local industrial-arts teacher organization on a parity with other subject field organizations when matters pertaining to subject fields are scrutinized.

All of the activities of the professional organization do not function directly to improve instruction, yet it is obvious that practically all of its activities indirectly affect the quality of instruction.

On many occasions officers of an organization will come to the supervisor for guidance and advice, but under no circumstance should the supervisor attempt to dominate the policies of the organization. These should always be democratically controlled by the membership.

Industrial-arts professional organizations on a state and national level take on different characteristics than those concerned only with local affairs. On the state and national level the industrial-arts group usually joins with other groups representing all phases of practical education. Thus we have state industrial-education associations, the American Vocational Association, and the American Industrial Arts Association. State professional associations parallel national associations in their organization, varying chiefly in the scope of their influence.

Why Join Professional Organizations?

Why should industrial-arts supervisors and teachers join these organizations? Of course, that is a matter for each individual to decide, but there are certain logical reasons for joining which may be simply stated:

1. In the case of the AVA, this national

organization presents a "solid front" when emergency matters arise affecting our educational field.

2. It co-ordinates local, state, and national organizations of industrial arts and vocational industrial education.

3. It interprets the philosophy, policies, and trends in industrial-arts education.

4. It "pools" new ideas and practices and disseminates this information through its publications.

5. It keeps teachers informed as to how industrial arts and vocational industrial education programs are functioning in all parts of the nation.

It appears necessary for all major subject fields to have national organizations to look after their specific interests and in this respect industrial-arts education is no exception.

The city supervisor observes that supervisors and teachers who join and give of their time to participate in professional organizations for the benefit of all are benefited themselves by doing better and more intelligent work on their jobs and by the satisfaction of giving something in addition to the usual duties for which they are paid. In their ranks are many who advance to positions of leadership.

Professional organizations perform a necessary educational function. A subject field whose members do not band together in an organization are committing educational suicide. City supervisors of industrial arts recognize this and constantly encourage teachers and fellow supervisors to belong to all reputable professional organizations.

PROBLEMS AND PROJECTS

FOLDING DRAWING-BOARD STAND

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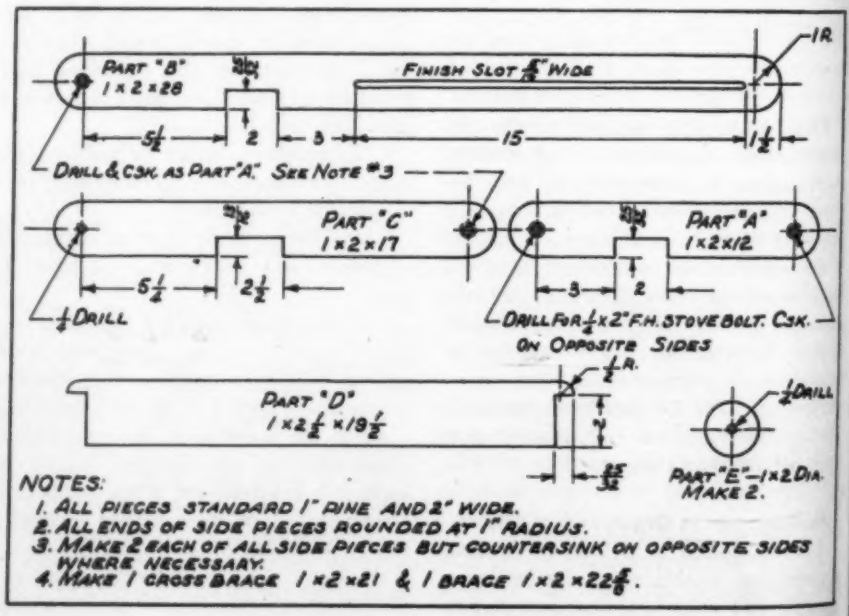
The two drawing-board stands shown and described in this article were once considered as *extra* projects to be made outside regular class hours, but they became so popular as a result of their usefulness that they were placed in the regular program of beginning woodwork. The table type was developed from the floor model and soon became the more popular of the two. However, the floor model serves as an extra serving table, card table, typewriter and writing stand when the drawing board is laid on top.

Practically every student in training in industrial-arts education elects to build at least one of these stands, and many from other fields are permitted to make one of them. The stands occupy only a small amount of space when folded for storage. For this reason students desire to make and use them in their rooms, trailers, or other residences.

Bench-type drawing-board stand

This project will prove of particular value to the teacher in a one-man teaching situation, especially where crowded conditions, lack of finances, or other difficulties make it necessary for sketching and drawing to be taught with drawing boards laid flat on the workbenches. The stand can be placed on the benches with the drawing board tilted at any desirable angle and the workbenches can become drawing and planning areas for the general or unit shop. The stands, drawing boards, and other equipment are easily and quickly stored in a cabinet or other suitable area where they will occupy but a small amount of space.

These projects can be made while teaching the use of hand tools and/or machines. However, the procedure given here is for the use of hand tools only in building the table model. Only the picture and drawing are shown for the floor model, but a production type of set-up is possible in making this latter project when teaching the use of woodworking machines to beginning students. By a slight revision in design, practically every standard woodworking machine can be brought into use.



Details of bench-type drawing-board stand

Tools and Equipment

Panel and ripsaw, try square, bench or folding rule, plane, dividers, coping saw, wood file, file card, hand drill, ¼-in. twist drill, or brace and No. 4 auger bit, wood chisel, mallet, countersink bit, marking gauge, hammer, and spokeshave.

MATERIALS AND SUPPLIES

No. of pcs.	*Part*	*Material*	*Size*
2	A	Pine	1 x 2 x 12
2	B	Pine	1 x 2 x 28
2	C	Pine	1 x 2 x 17
1	D	Pine	1 x 2½ x 19½
2	E	Pine	1 x 2 x 2
1	Cross brace	Pine	1 x 2 x 21
1	Cross brace	Pine	1 x 2 x 22⅝
4	F.h. stove or machine bolts		¼ x 2½
2	Stove or machine bolts		¼ x 3 in.
	Stove or machine bolts, four with standard square nuts, two with wing nuts, and all with ¼-in. washers, glue, and nails or screws		
	Sandpaper, stain, shellac, alcohol		

Procedure for Hand Tools

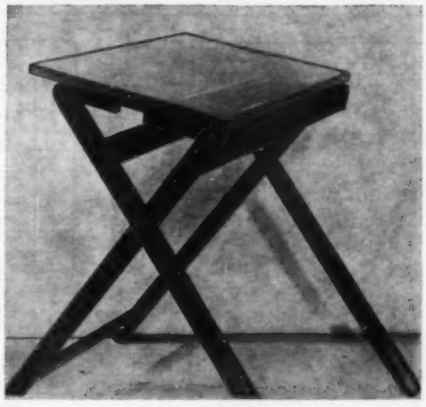
1. Using the crosscut and ripsaws, square and rule, lay out and saw necessary material, according to the bill of material, and allow for finish work.

2. Plane and saw to finish lengths and widths for all parts, if using standard 1 in. thick yellow pine.

3. Lay out rounded ends, and the wooden washers (part *E*). Saw out with coping saw and smooth ends with spokeshave, hand scraper, wood file, and/or sandpaper.

4. Lay out, saw, and chisel out all recesses for joints and lay out for all holes and the slots.

5. Bore or drill all holes and a portion of the slot using a hand drill and ¼-in. twist drill or a brace and No. 4 auger bit. By boring out a portion of the slot on one end and placing one hole at the other end, the slot can be sawed out, then smoothed with a wood file and sandpaper.



Floor-type drawing-board stand

6. Countersink necessary holes using a countersink bit and brace.

7. Sand all parts thoroughly and nail or screw and glue all parts together as necessary.

8. Assemble with bolts.

9. If a stain or other finish is desired, apply before assembling.

COMBINATION SEWING BOX AND FOOTSTOOL

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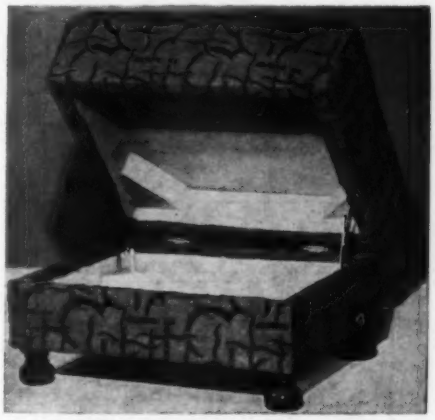
One of the big problems in the general shop is finding suitable projects that contain some of the essential operations which are within the student's range of ability, yet inexpensive. For many years the conventional type footstool has been used as one of the projects to fill these requirements.

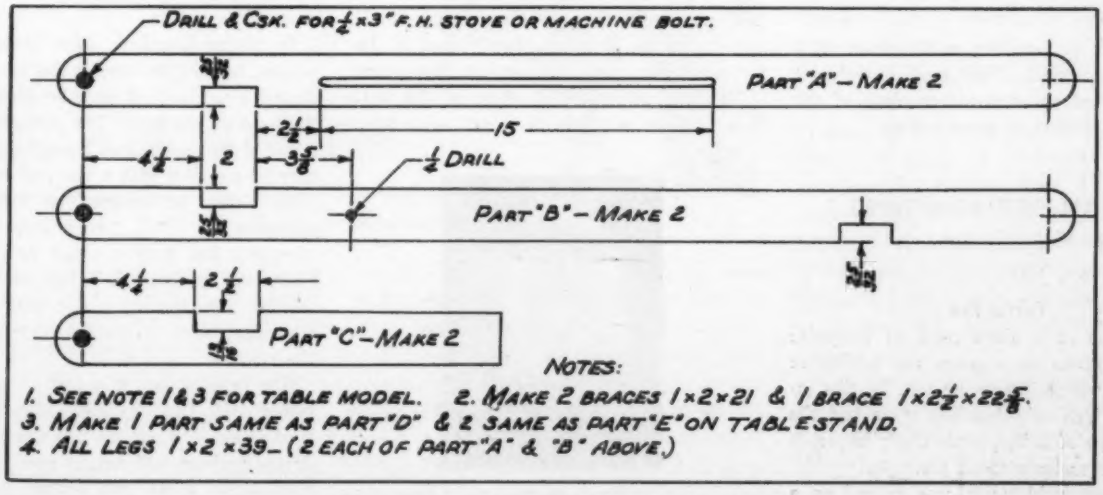
The accompanying illustrations show a footstool of a slightly different type. This one not only serves as a footrest, but also as a storage place for sewing materials. The stool fits in well in the general shop since it provides an opportunity for the student to do simple upholstery and elementary woodwork. The chief advantages of the project are its uniqueness and convenience. There is ample room within the stool for storage of all sewing materials required for small sewing jobs.

The wood for the rails and corner blocks may be any suitable softwood available. The design for the feet may be changed to suit the individual, but the height should remain the same.

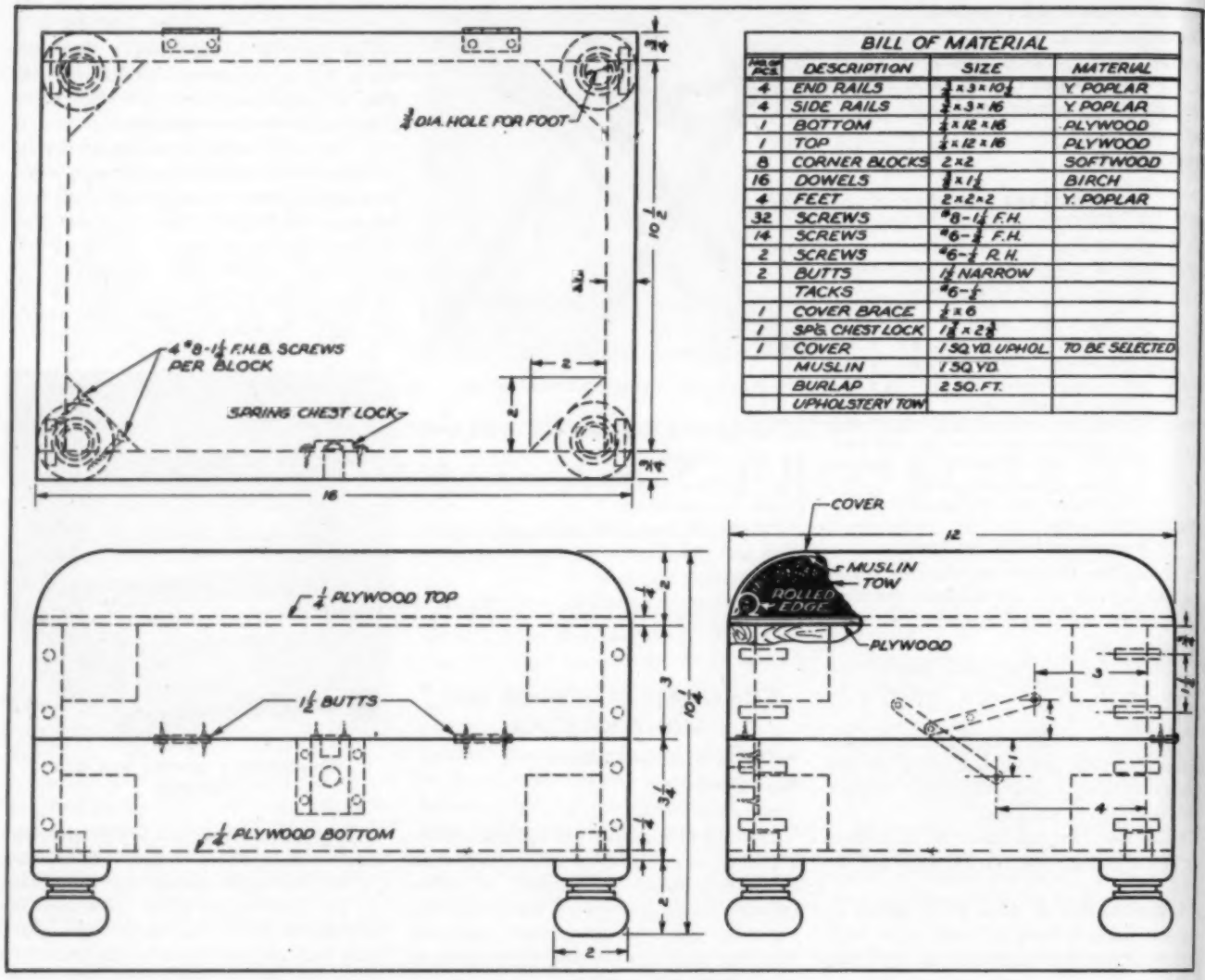


Combination sewing box and footstool

The plywood bottom and top are glued and nailed to their respective units. The holes for the feet are drilled through the bottom and into the corner blocks of the lower unit. The lock should be of the spring type which, when unlocked, enables it to be opened by merely pressing the lock cylinder. The cover brace is made of a card-table leg brace. It is


DRILL & CSK. FOR ¼ x 3" F.H. STOVE OR MACHINE BOLT.
PART "A" — MAKE 2
15
2½
4½
2
3⅝
½ DRILL
PART "B" — MAKE 2
4½
2½
PART "C" — MAKE 2
NOTES:
1. SEE NOTE 1 & 3 FOR TABLE MODEL. 2. MAKE 2 BRACES 1 x 2 x 21 & 1 BRACE 1 x 2½ x 22⅝.
3. MAKE 1 PART SAME AS PART "D" & 2 SAME AS PART "E" ON TABLE STAND.
4. ALL LEGS 1 x 2 x 39 — (2 EACH OF PART "A" & "B" ABOVE.)

Details of floor-type drawing-board stand



BILL OF MATERIAL

NO. OF PCS.	DESCRIPTION	SIZE	MATERIAL
4	END RAILS	¾ × 3 × 10½	Y. POPLAR
4	SIDE RAILS	¾ × 3 × 16	Y. POPLAR
1	BOTTOM	¼ × 12 × 16	PLYWOOD
1	TOP	¼ × 12 × 16	PLYWOOD
8	CORNER BLOCKS	2 × 2	SOFTWOOD
16	DOWELS	⅜ × 1½	BIRCH
4	FEET	2 × 2 × 2	Y. POPLAR
32	SCREWS	#8-1¼ F.H.	
14	SCREWS	#6-¾ F.H.	
2	SCREWS	#6-¾ R.H.	
2	BUTTS	1½ NARROW	
	TACKS	#6-¾	
1	COVER BRACE	¾ × 6	
1	SPR. CHEST LOCK	1⅝ × 2⅜	
1	COVER	1 SQ. YD. UPHOL.	TO BE SELECTED
	MUSLIN	1 SQ. YD.	
	BURLAP	2 SQ. FT.	
	UPHOLSTERY TOW		

Details of sewing box and footstool

necessary to cut off the brace so it will fold into the stool.

The inside of both top and bottom units should be enameled a light gray. Dowel pins may be placed on each corner block of the lower unit to serve as spool holders.

INDIAN SILVERSMITHING

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Hales Corners, Wis.

Turtle Pin

The shape of a given piece of torquoise often determines or suggests the setting or the use to which it may be put. In this instance the high cabochon-like stone had the general shape of a box turtle shell; hence, it was used to make a turtle pin.

This stone, incidentally, was ground on a 4-in. hand power grinding wheel and polished with tin oxide on a piece of buckskin. See description of how to do this on pages 76, 77, and 78 in the January, 1951, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

To carry out the shell effect on the turtle in a symbolic way, the bezel was made much higher than is customary and filed and stamped as shown.

Silver turtle pin or brooch

In cutting the blank, allow about 1/16 in. to project beyond the bezel where no legs, head, or tail are. This will later be filed flush with the base of the bezel. The crosshatch stamping is done with a fine lining tool. The eyes may be punched with a fine nail set or "raindrops" may be soldered on instead. After stamping the blank, turn it over on a block of wood, and with a small dapping punch, bump up the head and legs slightly. Don't file the claws too sharp, and bend them down somewhat to prevent them from catching on the clothing.

The bezel shown at 4 and 5 in Figure 1 is sawed first, then stamped, after which it is filed round. Do not use too fine a saw blade or the scallops will not fit over the stone as they should. A pin with a safety catch may be used instead of the one shown in Figure 1.

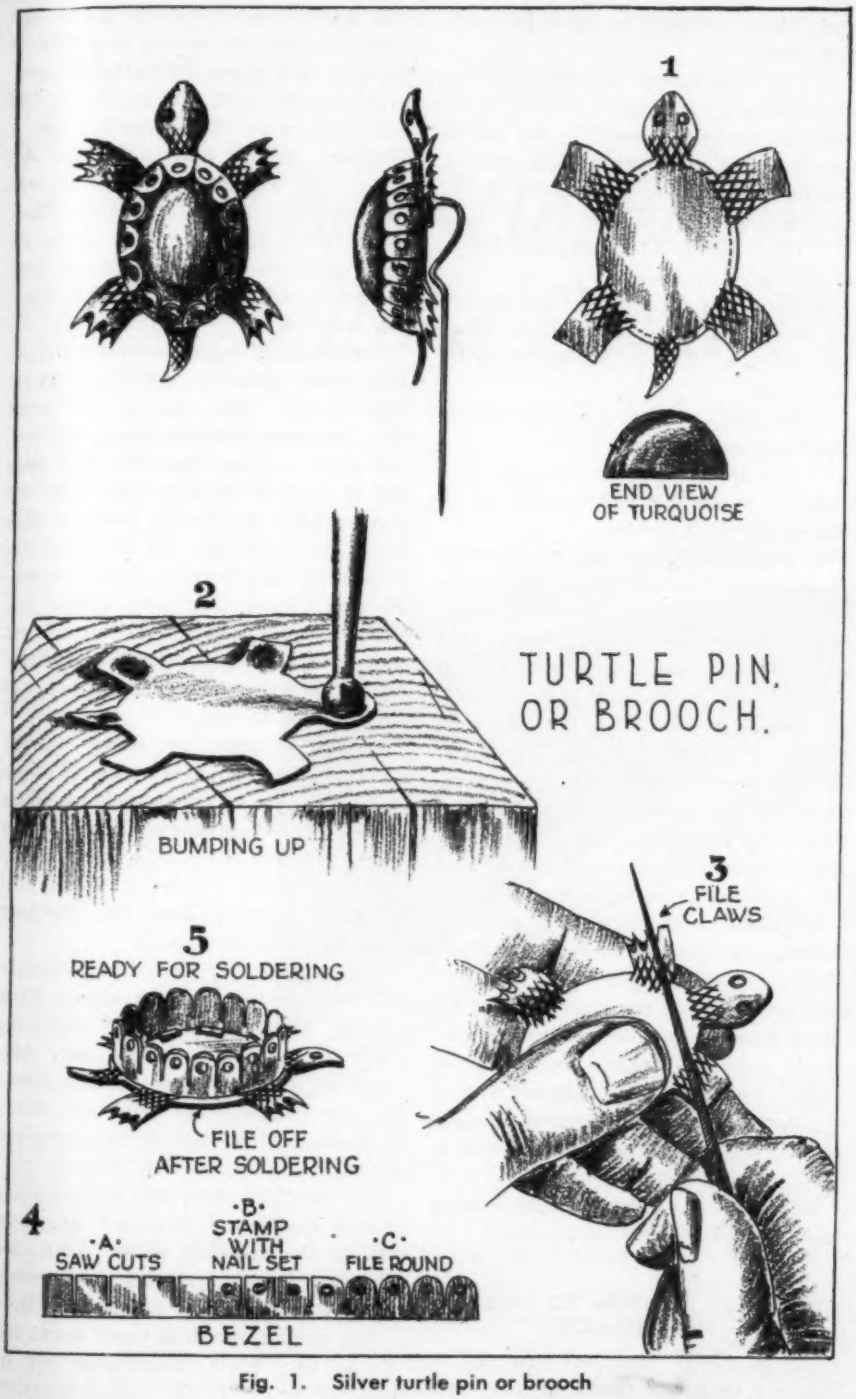


Fig. 1. Silver turtle pin or brooch

The chances are that you will not have a stone the same size as the one used for this pin, but the size of the pin can easily be changed to fit the stone.

INDUSTRIAL ARTS, STATE COLLEGE OF WASHINGTON

(Continued from page 100)

The electrical area has been planned to meet the needs of the general teacher in industrial arts or the specialist in this area. A beginning course in electricity and another in radio are required of everyone with advanced work in radio and electronics for the student wishing to do further work. The basic course in electricity includes the principles of electricity in theory and practice with a required series of projects and activities to be completed and used as teaching samples. The prospective teacher carries with him to his teaching job the basic skills needed for construction and servicing common electrical equipment, also additional drawings and plans for other projects and activities.

Courses to Meet the Needs of Industrial-Arts Teachers

In the advanced courses the principles of radio receivers and transmitters are stressed with the development of skill for common receiver servicing. Hobby club possibilities are not overlooked with training in code and amateur radio with its associated transmitter and receiving equipment.

Offerings, to meet the needs of the industrial-arts teacher, include such courses as leather, tooling plastics, simple weaving, making of archery equipment, fly tying, and other crafts. A course is offered in plastics with operations involving fabricating, coloring, casting, and forming. Sample projects are made suitable for people in the lower grades through high school. In leather, a beginning course covers staining, tooling, embossing, and lacing with practical projects that can be used for the different grade levels.

A service course designed to meet the needs of college women has been recently added to the curriculum. This course listed as "home mechanics" offers college women practical work experiences in hand tool operations, simple upholstering, refinishing, emergency plumbing, and other household exigencies.

The professional background of the industrial-arts teacher is given in the professional subject matter courses and these are required for everyone planning to teach. These include a special methods course for industrial-arts teaching and a problems course. Students through lecture and practice learn to prepare instruction sheets, evaluate projects, and develop courses of study. A study of textbooks and other pertinent information that is part of the teacher's job in the field is included in the professional training of the student. Variety is added by concentrated courses in many areas, namely: test and measurements, trade analysis, administration, and the general shop.

The future of industrial-arts education depends upon the teacher training institutions in meeting the present demand for highly qualified teachers in the technologies. The industrial-arts department of the

State College of Washington, realizing the significance of the Strayer report, has taken another step in an effort to meet these needs.

LEAVENWORTH HIGH SCHOOL VOCATIONAL ANNEX

(Continued from page 102)

machine cabinet making. This is a one-year course where the student is given instruction in the use of woodworking machines in constructing projects of his own choosing. Attention is given to proper application of appropriate wood finishes. The study of related subjects is stressed.

Mechanical drawing I and II is intended to develop the ability of the student to visualize. He learns the proper use of drawing materials and instruments. He is given some drill in lettering and in sketching. He studies the theory of shape description and the principles of size description. He comes to realize that mechanical drawing is the language of the industries.

Mechanical drawing III and IV is a continuation of courses I and II. Here the student may choose to specialize in either elementary machine drawing or elementary architectural drawing. He becomes better acquainted with the use of drawings for industrial purposes. Opportunity is afforded for him to strengthen his constructive imagination.

Vocation Courses:

Our institutional-on-the-Farm training course was organized for Veterans, August 1, 1947, under the provisions of laws 16 and 346. These laws stipulated that to be eligible for this training the veteran must either own a suitable farm or have jurisdiction over the management of one.

Since the organization forty veterans have been enrolled in our course. Since 24 is the class maximum allowable, a waiting list is kept and new enrollees accepted in the order of their application, when there is a vacancy.

The prescribed requirements are that the veteran spend 200–300 clock hours per year in classroom instruction, and that the instructor spend 96 hours per year on the farm of each veteran or in group instruction and/or demonstrations. The instructor must make at least two visits per month to each farm.

Among the topics stressed in the course are:

1. *The working out of a balanced farm plan.* This is intended to result in better farm living.

2. *Soil conservation and soil building.* The making of soil analyses helps to determine the treatment needed by the soil in each case. Soil treatment includes application of lime, manure, commercial fertilizers, and the use of legumes.

3. The building of terraces and waterways to prevent erosion.

4. A study of the principles involved in the proper selection, improvement, care, and feeding of all farm animals grown by the trainee.

5. Dairying and poultry raising are given important consideration.

6. Accurate records are kept by each trainee to enable him to know whether an item brings profit or loss.

As a minimum, 72 hours of shopwork per year are required. In our course the trainees are taught enough of the fundamentals of welding, soldering, forging, auto mechanics, carpentry, and cement work to enable them to do ordinary farm repair and maintenance jobs. In the shop such equipment as trucks, combines, and tractors are repaired and reconditioned. On the farms they have constructed such items as grade-A dairy barns and shelter sheds. They have learned to install running water, electricity, and insulation in their homes.

Retail selling is offered to a group of students who spend part time in school and part time in actual employment. The classwork is taught and the supervision on the job is done by an instructor-co-ordinator who is experienced both in teaching and in selling. The room is equipped with a wrapping counter, cash register, display mannequins, and other equipment found in retail establishments.

An increasing number of adult evening classes are being housed in the annex.

TECHNICAL ADDITION TO TUCSON HIGH SCHOOL

(Continued from page 114)

This is a vocational course to train boys for the automotive field.

The machine shop department has fifty thousand dollars worth of tools, material, and equipment. The student may choose a three-hour vocational or a one-hour advanced machine course. The jobs in the vocational course are centered around practical applications of good machine shop practice, while the jobs in the one-hour course are projects.

In driver training, Gordon Logan, one of three instructors, showed us a little of the work that is being done to put good drivers on the road. The school has two 1950 cars with dual control: one a Chevrolet, and the other a Pontiac. Results of this course are expected to show both immediate and future results. These courses strive to bring out a desire for use of good sense behind the wheel, both as a young driver and as an adult driver later on.

The home-economics department, physics department, chemistry department, an art room, a craft room take up the second floor. The home-economics department consists of two cooking rooms having 12 sinks and 12 stoves in separate units. Each unit is a complete kitchen in itself. A deep freeze, electric washer and drier, and two refrigerators have been installed. Two sewing rooms have their own cutting and fitting rooms. Completing the department is a small apartment consisting of living room with dining alcove, folding bed, and tile bath and shower.

Entirely separate, yet fitting into the scheme of the program is a required course in sociology on American problems which includes family problems. There is also the volunteer club for girls known as the coed club, whose purpose is problem discussion of American home life. The boys have the bachelors club.

In the chemistry department concrete sills at the doors of the storage room prevent spreading of spilled chemicals, while an exhaust fan does away with chemical odors. The physics department has two lecture rooms with floors raised in graduated tiers making for clearer observation of demonstration lectures.

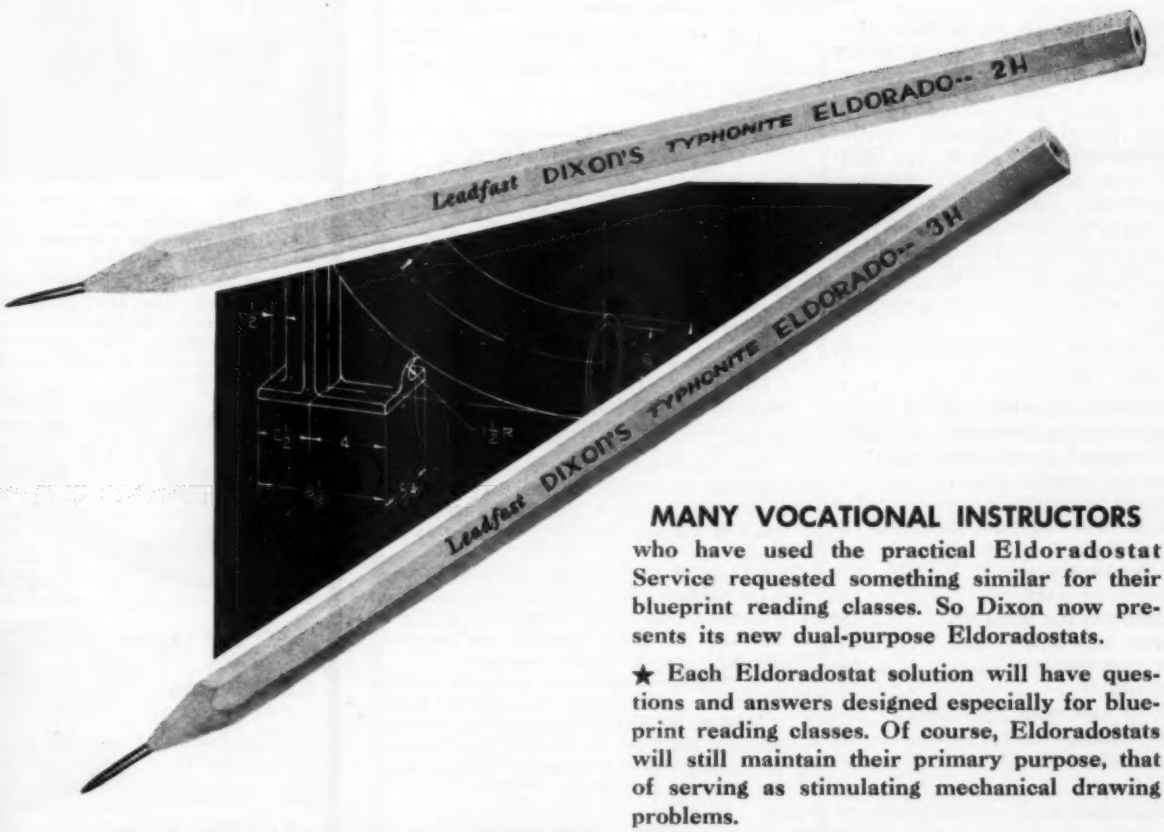
On the third floor will be found advanced typing and shorthand classes, as well as the workshop of the distributive education classes. Here is a model store, and a store front with display window.

The graphic-arts department boasts one of the very finest photographic labs in any high school in the United States. It is the end result of an afterschool hobby club begun by Harry Goldstein, instructor of photography, and Otis Chidester, director of graphic arts. The photography club grew so swiftly and proved so popular, it was added to the printing which both men taught, becoming a part of the graphic-arts department, which today has grown to five teachers in the department. Graphic Arts

(Continued on page 22A)

New Blueprint Reading Service!

The New Eldoradostat with a Dual Purpose



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TECHNICAL ADDITION TO TUCSON HIGH SCHOOL

(Continued from page 136)

I and II offers the student a basic course in (1) general printing, (2) in binding of snapshots and notebook covers, marbelizing of end sheets, etching, linoleum block carving, papermaking, (3) photography; (*a*) contact printing and (*b*) enlarging, and film handling. Specialization comes after the first year.

In advanced photography all the school publication work is done, and there is a series of work projects in which the students not only learn how but also why.

The first year graphic-arts textbook which is used at the school was written by Mr. Chidester.

PERSONAL NEWS

(Continued from page 6A)

Dr. and Mrs. Smith expect to continue their residence in Columbus and to continue the writing and revision of his textbooks which have been so well received throughout the country.—*Robert W. Haws.*

DR. WILSON APPOINTED

Dr. Lewis A. Wilson has been appointed president of the University of the State of New York and Commissioner of Education of the state of New York.

Since the death of Commissioner Francis T. Spaulding on March 25, 1950, Dr. Wilson has been acting as head in both of the positions to which he has now received appointment as chief executive.

In 1911 he was appointed specialist in vocational education, and deputy commissioner of education for the state of New York. Under his leadership vocational education and vocational guidance have been greatly expanded.

Dr. Wilson was graduated from the academic department of Brockport State Normal School. He received his professional training at Mechanics Institute, Rochester, N. Y., The Stout Institute, Menomonie, Wis., and Teachers College, Columbia University, New York City.

EIFFEL A. HOLM RESIGNS

At the regular annual meeting of the Board of Vocational and Adult Education held January 16 at the Central Vocational School at Wausau, Wis., Eiffel A. Holm, director of the Vocational School for the past 31 years, resigned his position effective at the close of the school year, June 30, 1951, on account of a physical disability. Mr. Holm was injured five years ago when a large freight van jackknifed in front of his car.

He received a diploma from Stout Institute in 1916, his bachelor of science degree from Colorado State in 1932, and his master of art's degree in 1936 from Columbia University.

Mr. Holm will be on a leave of absence basis during the second semester of this school year. However, he will act as consultant to the board and to the acting director during this time on finances and other problems that may arise from time to time.

Lawrence B. Hoyt, assistant director, was appointed acting director for the balance of the

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school year. Acting Director Lawrence Hoyt is also a Stout graduate.

EDWARD E. CAIN DIES

Edward E. Cain, 66, field co-ordinator for the apprentice division of the Milwaukee Vocational and Adult Schools, Milwaukee, Wis., died recently after a heart attack.

Mr. Cain served as liaison man between the school's apprentice division and the industries for the past 23 years.

♦ Leo S. Scott has returned from a year in the schools of Germany, and is busy planning the new industrial-arts department at Clinton, Mo.

♦ Hollis W. Dahlor, director of vocational education, Kansas City, Mo., was a guest professor at the State Teachers College at Natchitoches, La., this past summer.

♦ Dr. H. H. London was a member of the committee which met in Chicago, September 11 and 12, to plan the 1951 Regional Trade and Industrial Conference of state supervisors and teacher trainers. The conference is held each February and is sponsored by the U. S. Office of Education.

♦ William H. Lyon of Marshall, Mo., is now director of community recreation and is teaching safety education courses in Missouri Valley College and Marshall High School.

♦ Parley Conard has been appointed welding instructor at the Lead Belt Vocational School, Bonne Terre, Mo. He is a graduate of Kansas State Teachers College, Pittsburg, Kans.

♦ Robert Turner, Emerson Matthews, and Elwood Robertson, all on the industrial-arts staff at Northwest Missouri State Teachers College, took additional graduate work at Colorado A. & M. College, Fort Collins, Colo., during the past summer.

♦ Merl Case has been employed as the industrial-arts instructor at Carrollton High School, Carrollton, Mo.

♦ Harry Rice is the new industrial-arts instructor at Trenton Junior High School, Trenton, Mo.

♦ Harold Gilbert, instructor in general metal at Oswego State Teachers College, has been granted a leave of absence to study and teach at Ohio State University.

♦ Harold Steffen has been appointed assistant professor in drafting at Buffalo State Teachers College. He replaces Professor George M. Quackenbush who has retired.

♦ William Allen, formerly instructor of industrial arts at Beaver Falls, N. Y., has been appointed instructor in general metal at Oswego State Teachers College to replace William E. Huss, who has been granted a leave of absence to work toward his doctorate.

♦ Michael M. Katzoff, assistant administrative director, Vocational High School Division of the city of New York, has been made principal of the Bronx Vocational High School.

He takes the place of Theodore W. Langenbahn, who has retired.

♦ Albert E. Schaupp, instructor of leathercraft and shoe repair at the Paul Revere Trade School, Rochester, N. Y., retired last June after 26 years of service. He was also a member of the summer school teaching staff of the Oswego State Teachers College for many years. At a dinner held in his honor, Assistant Superintendent of Schools, Verne Bird, conferred upon him the degree of D.A.U. (Doctor Adolescent Understand-

(Continued on page 26A)

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Direct Current Motor Manual *by H. S. Dusenbery*
The first up-to-date text on the electrical principles, construction and maintenance of d-c motors, generators, and their allied electronic control equipment. Explains every part, every circuit, with clear wiring diagrams and full maintenance charts. $3.50

An Introduction to the Science of Photography
By Katherine Chamberlain. A simple, understandable explanation, for those with no previous knowledge of physics, of the principles governing the camera, focusing, estimation of exposure, developing, printing, etc., with full attention to color. $4.75

Aircraft Mechanic Series
By Rollen H. Drake
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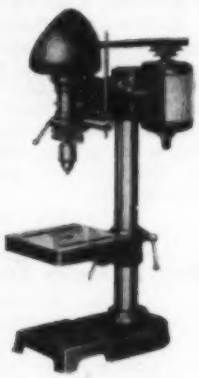

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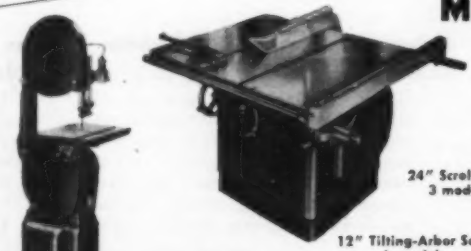

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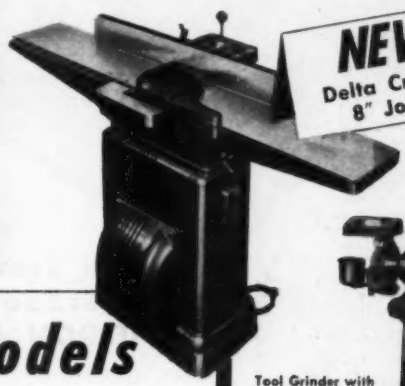

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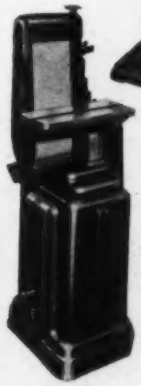

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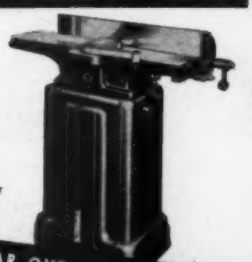

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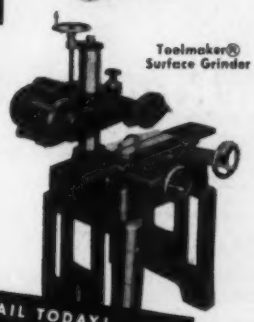
2 models



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PERSONAL NEWS

(Continued from page 23A)

ing) in recognition of his effectiveness in dealing with young people.

♦ O. ARNOLD RADTKE retired at the close of the semester last June. He received a thirty-year service award from the industrial-arts teachers and a emeritus certificate from the Board of School Directors for thirty years of successful service in the Milwaukee public schools. At the end of World War II he received a citation from the President of the United States.

♦ EVERETT S. LEE has been appointed editor of the "General Electric Review," monthly engineering magazine published by the General Electric Company.

Mr. Lee succeeds Edward C. Sanders, who retired recently from the company after serving since 1926 as executive editor of the publication.

Mr. Lee formerly was executive engineer of the G-E General Engineering Laboratory in Schenectady and is a past president of the American Institute of Electrical Engineers. In addition to his editorial duties, he will continue his active work in professional engineering and engineering educational circles.

♦ HARRY WILSON, director of vocational education, Watertown, N. Y., is operating pre-employment classes for adults.

♦ ALBERT T. TURNER, principal of the Schenectady Vocational High School since 1935, retired in June. Mr. Turner had 27 years of service with the Schenectady schools starting as a machine-shop teacher and later becoming head of the industrial department of the Vocational High School. For many years he taught industrial teacher training courses at Oswego State Teachers College and New York University during the summers and served on the Capital District staff for such courses in the evening sessions. CHARLES W. CLARK of the same city is now director of vocational education.

♦ EDWARD CHALL, related plumbing instructor who came to the Veterans Vocational School, Troy, from New York City in 1947, died suddenly on June 16.

♦ RICHARD A. REGAN, one of Buffalo's pioneers in vocational education, retired as principal of Seneca Vocational High School in June. He entered the Buffalo School System as a teacher in Peckham Vocational High School in 1911 after having taught in the schools of Chatauqua County. He served in that school as assistant principal and continued as such after it moved into its new building and became known as Peckham Vocational High School. Later he was appointed principal of that school which has since been named Emerson Vocational High School. About eight years ago when Elmer Pierce retired, he was also made principal of the Seneca Vocational High School.

♦ DAVID WARNHOFF, formerly administrative assistant at Seneca Vocational High School, Buffalo, N. Y., has been made principal of Emerson Vocational High School. He received one of the first industrial certificates at Cornell University.

♦ LAVERNE H. ENGEL, formerly assistant principal at Seneca Vocational High School, Buffalo, N. Y., has become its principal. Mr. Engel started in the vocational field as a teacher of related mathematics and was at one time assistant principal at Burgard Vocational High School.

♦ HENRY MANDEL, for the past few years assistant professor of industrial arts, New York State College for Teachers, Buffalo, has recently taken an appointment as associate supervisor in the Bureau of Trade and Technical Education, State Education Department.

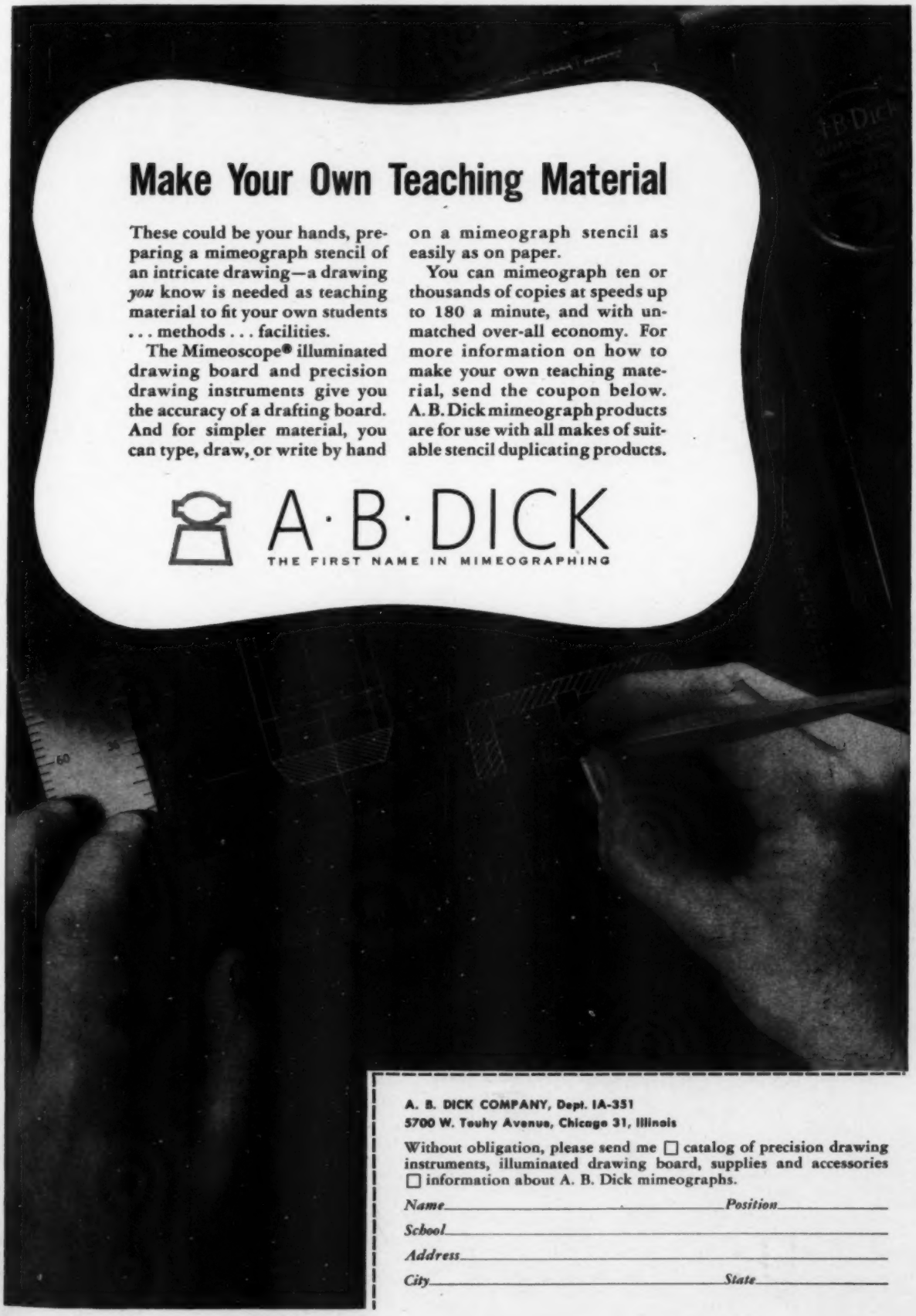
Mr. Mandel has had over 18 years of industrial experience and 16 years of teaching experience in automobile mechanics at the Saunders Trades School, Yonkers. He is one of the early industrial scholarship students from State Teachers College, Buffalo; holds degrees from Teachers College, Columbia University; and has completed most of his work for a doctorate at the University of Buffalo.

♦ RUSSELL EMIG has been promoted from department head to assistant principal of the George Trade School, Detroit, Mich.

♦ JACK SLAGLE has been appointed to the staff of the Veterans "on the Job" training division.

♦ ROLAND MORGAN, director of vocational education, Herkimer, N. Y., has announced the introduction of a unit on business English in the course for plumbers apprentices. This unit will emphasize proper techniques of business correspondence and the writing and interpreting of contracts, specifications, and bidding proposals.

♦ ALBERT H. COVELL, superintendent of schools, Oneida, N. Y., is offering classes of related instruction for apprentices in auto mechanics and the related building trades. These classes are under the supervision of Basil Emerson, director of adult education.



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Metalworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

AIR COMPRESSORS — for machine shop, foundry, or forge shop
ANVIL — 100 lb.
ARBOR PRESS — bench or pedestal type
BARROWS
- a) Coke
- b) Foundry
- c) Scrap

BELT LACER
BENCHES
- a) Coremaking
- b) For metal working, iron or steel legs. Tops, metal or hardwood lumber, 1¾ in. to 2½ in. thick
- c) Molding

BLACKBOARD — permanent or portable
BLOWERS — for furnaces, forges, etc.
BLOWTORCH — 1-qt. size
BOOKCASE — for reference books, catalogs, etc.
BORING BAR
BORING MILL — vertical or horizontal
BULLETIN BOARD
CABINETS — Wood or metal, for filing class records, instruction sheets, drawings, etc., and for tools and supplies
CASEHARDENING BOXES
CENTERING MACHINE
CHAIN HOISTS — differential, duplex or triplex
CHAIRS — Teachers', and tablet arm if needed for related-subjects room, or for demonstration section
CHUCK
- a) Drill, selected sizes
- b) Lathe, combination, 4 jaw, selected sizes
- c) Lathe, independent, 4 jaw, selected sizes
- d) Lathe, universal 3 jaw, selected sizes
- e) Milling machine, universal

CORE OVEN — for foundry
CRANES AND HOISTS — air, electric, or hand, of the jib, traveling, or portable type
CUPOLA — for foundry, coke, or electric, ¼- to 1-ton capacity
DESK — teacher's, with drawer compartments
DIE-FILING MACHINE
DIVIDING HEAD
DRILLS
- a) Bench, hand
- b) Breast
- c) Electric, portable
- d) Hand
- e) Post, hand or power
- f) Radial
- g) Sensitive
- h) Upright, power

FLASKS — 2 or 3 part, steel or snap type
FORGE — coal or gas, with hand- or electric-driven blower
FURNACES
- a) Annealing
- b) Bench
- c) Brass and soft metal
- d) Combination bench
- e) Casehardening
- f) Cyanide
- g) Gasoline
- h) Heat-treating
- j) Melting

GEAR-CUTTING MACHINE
GRINDER
- a) Bench, hand or power driven
- b) Combination grinder, buffer, and polisher
- c) Emery, bench or pedestal type
- d) Face, with magnetic chuck
- e) Portable tool post
- f) Precision, for external and internal grinding
- g) Universal tool cutter, drill and reamer grinder
- h) Wet tool

HACK SAW — motor or belt driven
HAND PICKS — for cleaning inside of cupola, 1¼ to 2½ lb.
HARDNESS TESTING MACHINE
LATHES — belt or individual drives
- a) Automatic
- b) Bench, 6-in. to 11-in. swing, 11 in. to 36 in. between centers
- c) Change gear, 9-in. to 14-in. swing, 18 in. to 36 in. between centers
- d) Quick-change gear, 9-in. to 16-in. swing, 18 in. to 36 in. between centers
- e) Semiquick-change gear, 9-in. to 18-in. swing, 18 in. to 42 in. between centers
- f) Turret
- g) Metal spinning

MILLING MACHINE
- a) Plain, cone or motor-driven type
- b) Universal, cone or motor-driven type

NIBBLING MACHINE
PIPE CUTTER
PLANER — belt or motor driven
POWER HAMMER — for forging operations
PUNCHES — metal, hand, or power
PYROMETER
PYROSCOPE
RELIEVING ATTACHMENT FOR LATHE
SAND SIFTER — for foundry, hand or power
SANDBLAST OUTFIT — with cabinet
SCALE
- a) Counter for machine shop
- b) Platform, for foundry, 1000-lb. capacity

SHAPER
SNAP-FLASK JACKETS — to fit snap flasks used
STRAIGHTENING PRESS
SURFACE PLATES
SWAGE BLOCK AND STAND — for forge shop
TAPER ATTACHMENT FOR LATHE
TRUCK — warehouse
TUMBLING BARREL — for foundry
VISES
- a) Blacksmith
- b) Drill press
- c) Machinist
- d) Pipe
- e) Planer
- f) Shaper

WELDING OUTFIT
- a) Acetylene
- b) Electric

Metalworking — Small Tools

ARBORS
- a) Drill chuck to suit requirements
- b) Reamers, various sizes
- c) Shell tool, various sizes
- d) Straight shank for shell reamers and shell drills, selected sizes
- e) Taper shank for shell reamers and shell drills, selected sizes

BEARING SCRAPER
BELLOWS — for foundry class
BEVEL PROTRACTOR
BROOMS AND FLOOR BRUSHES — for shop and foundry
BRUSHES
- a) Bench
- b) Core box
- c) Core painting
- d) Hard brushes for foundry
- e) Floor
- f) Soft brushes for foundry

BULB SPONGES — for molders
DRAW PINS — for molders
CALIPERS
- a) Hermaphrodite, 4 in. and 6 in.
- b) Inside, 4 in. and 6 in.
- c) Outside, 4 in. and 6 in.

CANS
- a) Oil, ½ pt., 1 pt., and 10 gal.
- b) Waste

CENTER TESTERS
CHISELS
- a) Cape, 3/16 in. and 3/8 in.
- b) Cold, 3/16 in. and ¼ in.
- c) Diamond point, 3/16 in. and ½ in.
- d) Roundnose, 3/16 in. and ½ in.

CLAMPS
- a) 4 in., 6 in., 8 in., and 10 in.
- b) Flask, for foundry
- c) Strap, various sizes

CAKE FORKS — for foundry
COLLETS
- a) For milling machine, selected sizes
- b) For lathe, selected sizes.

COMBINATION SQUARES — with hardened head and blade, and protractor head, 9 in. and 12 in.
COUNTERBORES — straight and tapered shanks, selected sizes
COUNTERSINKS — for metal
CRUCIBLE TONGS — to fit crucibles
CRUCIBLES — selected sizes
- a) Shanks, single end to fit ladles
- b) Shanks, hand, to fit ladle bowls

CUTTERS — angular milling, bevel gear, concave milling, convex milling, end milling, face milling, formed milling, grooving, involute gear teeth, key seat, side milling, and metal slitting
DIVIDERS — Spring, 4 in. and 6 in.
DRILLS
- a) Drifts, different sizes
- b) Sleeves, different sizes
- c) Stand for Nos. 1 to 60
- d) Stand for 1/16 in. to ½ in. by 64ths

DRILLS
- a) Center
- b) High speed, taper shank, various sizes
- c) Jobbers, straight shank, 1/16 in. to ½ in. by 64ths
- d) Ratchet
- e) Straight shank, Nos. 1 to 60
- f) Taper shank, ½ in. to 1 in. by 16ths

FILE CARDS
FILES
- a) Die sinkers, various shapes
- b) Flat bastard, 8 in., 10 in., 12 in., and 14 in.
- c) Half round, double cut, 6 in., 8 in., 10 in., and 12 in.
- d) Hand, smooth, 8 in., 10 in., and 12 in.
- e) Mill, smooth, 8 in., 10 in., and 12 in.
- f) Round bastard, 8 in., and 10 in.
- g) Square bastard, 8 in., and 10 in.
- h) Swiss, various shapes
- j) Three-square, double cut, 6 in.
- k) Warding, double cut, 6 in.

FIRST-AID CABINET AND SUPPLIES
FORGE TOOLS — drift pins, flatters, fullers, hand and handle punches, hardies, hot and cold cutters, set hammers, and swages for the forge shop
GATE STICKS — maple for foundry
GAUGES
- a) Center
- b) Depth
- c) Drill and wire
- d) Screw pitch, select kinds
- e) Surface
- f) Thickness

GLOVES — asbestos, for foundry
GOGGLES
- a) For machine shop
- b) For foundry

HACK SAW
- a) Blades, hand, 18T, 10 in.
- b) Blades, power, 14T, 12 in.

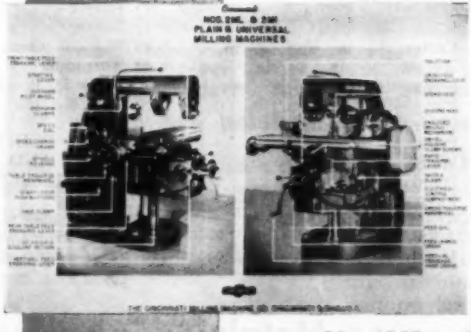
(Continued on page 30A)

Training Aids

FOR YOUR SCHOOL SHOP PROGRAM

Instructors everywhere are finding it advantageous to use these Cincinnati training aids. There's no question about it . . the boys you train today will encounter CINCINNATI Milling, Grinding and Cutter Sharpening Machines in industry tomorrow. So why not take advantage of the material Cincinnati offers to school shop instructors? With these booklets and diagrams, students quickly grasp the fundamentals of machining and familiarize themselves more readily with the function and location of various units and controls of the machines. Copies will be sent to instructors free on request. Or they are available in quantities at a modest charge.

Recommendations for Carbide Milling . . . No. M-1614
Recommendations for Sharpening Carbide Milling Cutters . . . No. M-1714
Explaining the Centerless Principle with the aid of a Wood Model . . . No. G-509
Principles of Centerless Grinding . . . No. G-503-1
General Catalog . . . No. M-1684
Look Sharp at Your Cutters . . . No. M-1657-2
Milling Machine Practice . . . No. M-773-1



Functional diagrams for a number of machines will be sent to school shop instructors on request. The diagrams, enlarged photos indicating the principal units and controls, are useful for classroom discussions. They are available for the machines listed below. Tables of leads and index tables, mounted on cardboard 14" x 18" for use with CINCINNATI Dividing Heads, are also available. If you are interested in information about two 16 mm color movies, "Highway to Production," and "Age of Precision," write us.

No. 2ML and 2MI Milling Machines
Dial Type Milling Machines
O-8 Vertical Milling Machine
No. 2 Cutter and Tool Grinder
No. 2 Centerless Grinder
12" Hydraulic Universal Grinder

CINCINNATI

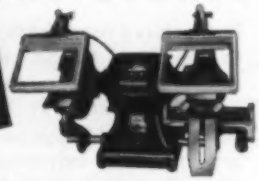
Please address all requests for training aids to the Technical and Service Publications Dept., The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES
MILLING MACHINES • CUTTER SHARPENING MACHINES
BROACHING MACHINES • FLAME HARDENING MACHINES
OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

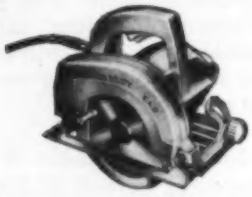
EQUIP NOW FOR THE YEARS AHEAD WITH STANLEY ELECTRIC TOOLS

DRILLS — available in 17 sizes in capacities to 1¼". No. 24 shown, ¼" capacity.



BENCH GRINDERS — for light or heavy duty. Six sizes from ¼ to 1 h.p. No. 677 Tool Grinder shown, ¼ h.p.

UNISHEARS — 10 models with capacities from 18 to 6 gauge. No. U218 shown, cuts up to 18 gauge.



SAWS — four sizes, 6", 7", 8", and 9". Many exclusive features. No. W65 shown, 6" blade.

OVERARM ROUTERS — for Maximum versatility. No. ORS5A-1 Combination Router and Shaper shown.

ROUTERS — high speed for precision work. Four models from ⅓ to 3 h.p. RS-8 shown, ⅓ h.p.

NO. 61 DOVETAIL ATTACHMENT — Dovetail joints easily accomplished with this Attachment and Stanley Router.

Equip your shop now with Stanley Electric Tools. Good equipment is necessary for the proper training for your students in the years ahead. The advanced design and quality construction of Stanley Electric Tools make them the ideal choice for all school shops. Reasonable first cost and long, steady performance assure maximum economy. Send the coupon today for the complete catalog. Stanley Electric Tools, Educational Department, 411 Myrtle St., New Britain, Conn.

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Hardware • Tools • Electric Tools • Steel Strapping • Steel

EYESHIELDS — safer, more sanitary than goggles. No. 600 shown, 4" x 6" window, illuminated. Adaptable for use on most grinders.

Stanley Electric Tools, Educational Dept.
411 Myrtle St., New Britain, Conn.

Gentlemen: Please send me your complete catalog of Stanley Electric Tools.

Name.....

School.....

Street.....

City & State.....

Subject you teach.....

(Continued from page 28A)

c) Frames, adjustable
HAMMERS
a) Babbitt
b) Ball peen, 13 oz., 16 oz., or 20 oz.
c) Blacksmith's, various kinds
d) Riveting, 9 oz., and 12 oz.
e) Setting
INDICATOR
a) Center
b) Universal or universal dial test
c) Speed
KNURLING TOOL — with assorted knurls
LADLES
a) Bull
b) Hand bowls
c) Melting
LATHE DOGS — ½ in., ¾ in., 1 in., 1½ in., 2 in., 2½ in., and 3 in.
LEGGINGS — fireproofed duck, to protect students when pouring in foundry
LEVEL — 6-in. bench
LIFTING SCREWS — for molders
MALLETS — wood or soft
MANDRELS — selected sizes
MICROMETERS — inside, 1½ in. to 8 in.; outside, 0 to 1 in.; outside, 1 in. to 2 in.; outside, 2 in. to 3 in.
MOLDING BOARDS
MOLDING STICKS AND TROWELS — various kinds
NIPPERS — end cutting, 5 in.
OIL STORAGE TANK — with pump
OILSTONES — medium and fine
PAILS — galvanized, 12-qt. capacity for foundry
PARALLELS
a) Adjustable
b) Steel, assorted sizes
PLIERS
a) Combination, 6 in.
b) Side-cutting, 6 in.
PUNCHES
a) Center, ¼ in. and ⅜ in.
b) Hollow, ½ in., ¾ in., and 1 in.
c) Pin, ⅛ in., 5/32 in., 3/16 in., 7/32 in., and ¼ in.
d) Prick, ¼ in.
RAMMERS — for foundry
a) Hand
b) Floor
REAMERS — various sizes
a) Adjustable
b) Hand
c) Taper pin
d) With taper shank
RIDDLES — ¼-in. and ⅛-in. mesh, 18-in. diameter, for foundry
RIVET SETS — assorted sizes
SCALES
a) Steel, 6 in., graduated 1/64 in. to ⅛ in.
b) Steel, 12 in., graduated to 32nds
SCREW DRIVERS — 6 in. and 9 in. blade
SCRIBERS
SHOVELS
a) Coke
b) Sand
SNIPS — tin, 3 in. straight and 3 in. curved
SOCKETS — for taper shanks, drill and tools, selected sizes
SOLDERING COPPERS AND HANDLES — 1-lb. size
SPRAY CAN — for molders
SPRINKLING CANS — galvanized iron, 16-qt. capacity, for foundry
SPRUE PICKS — for molders
SQUARES
a) Machinist's, 6 in.
b) Blacksmith's
STEEL FIGURES — ⅛ in.
STEEL LETTERS — ⅛ in.
SWABS — for molders
TAPELINE — steel, 25 ft.
TAPS AND DIES
a) Machine screws
b) Pipe
c) N.F. ¼ in. to ¾ in.
d) N.C. ¼ in. to ¾ in.
TONGS
a) Blacksmith's, various kinds
b) Pick up, for foundry
c) Shake out, for foundry
TOOL HOLDERS
a) Boring tools
b) Cutting-off tools
c) Planer
d) R.H. and L.H. offset shank
e) Shaper
f) Slotter
g) Straight shank
h) Threading
TOOL-HOLDER BITS — square, ¼ in., 5/16 in., ⅜ in., 7/16 in., ½ in.
TRAMMEL POINTS
V BLOCKS AND CLAMPS
WHEEL DRESSER
WRENCHES
a) Adjustable, 8 in. and 10 in.
b) Pipe, 8 in. and 12 in.
c) Tap, adjustable, various sizes

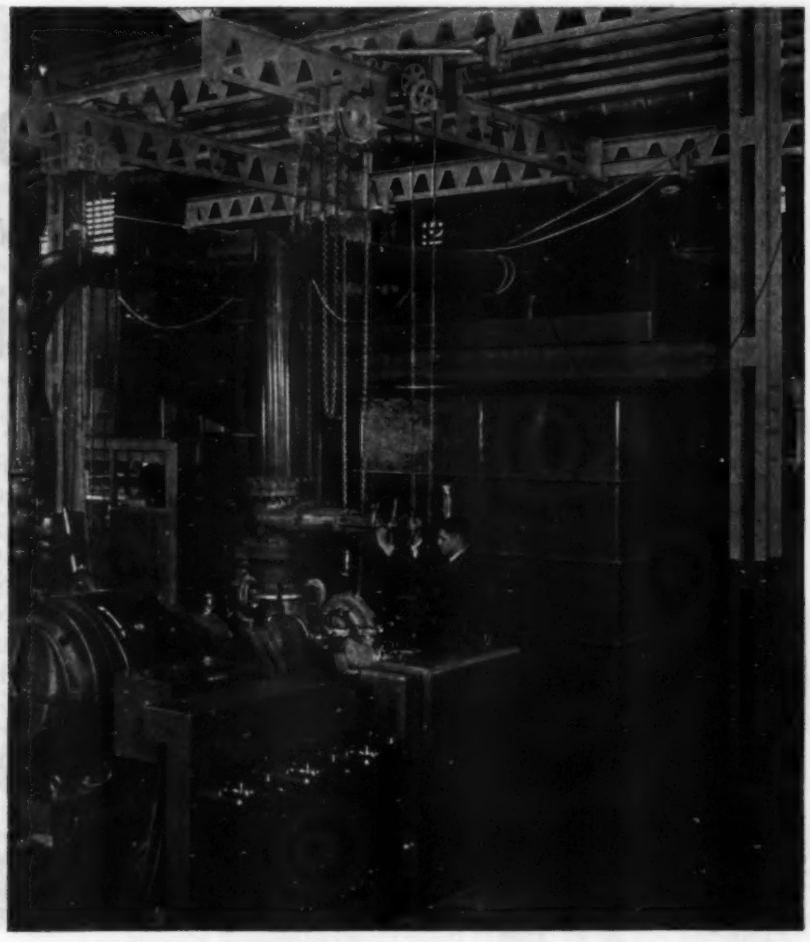
Metalworking — Materials and Supplies

ABRASIVE CLOTH — aluminum oxide. Grits 320 to 24, obtainable in sheets or rolls from 1 to 28 in. wide
ABRASIVE WHEELS
ACETYLENE GAS — in drums for welding
ALUMINUM
a) Pigs for foundry
b) Sheets, tubing, rounds, shapes, wire, etc.
BABBITT METAL
BEARING BLUE
BELT DRESSING
BELT LACING MATERIAL
BELT LEATHER
BOLTS
a) Carriage, selected sizes
b) Lag, selected sizes
c) Machine, selected sizes
d) N.F., selected sizes
e) Stove, flat or roundheads, selected sizes
BRASS
a) Bars, 3/32 in., ⅛ in., 3/16 in., and ¼ in. thick; ⅜ in. to 1 in. wide, 8 ft. to 10 ft. long, selected sizes
b) Round rods, 3/16 in. to ½ in. by 16ths, selected sizes
c) Sheets, 28 to 32 American gauge, 12 in. wide by 72 in. to 84 in. long, selected sizes

(Continued on page 33A)

Pittsburgh COLOR DYNAMICS

is used by Allis-Chalmers to make Pump-Testing More Efficient



Modern vocational schools teach future shopmen how this new painting system improves production and housekeeping!

TRAINING of skilled shopmen is no longer confined merely to courses in metal, machinery and methods. It includes study of the influence of physical and psychological factors upon workmen and their output.

● **That's why** vocational and manual science teachers now include Pittsburgh's COLOR DYNAMICS in their courses. They recognize that greater knowledge and more widespread use of this method of painting are making a great contribution to the improvement of production and welfare of workers.

● **Shopmen** in many plants, such as the pumproom of the Allis-Chalmers Manufacturing Company of Milwaukee, Wis., are finding that color properly "engineered" on machines, walls, floors and ceilings contributes substantially to the improvement of efficiency and morale.

● **COLOR DYNAMICS** requires that every color used on walls, floors, ceilings, machines and mobile equipment perform definite duties.

● **By the use** of focal and eye-rest colors, operating parts of machines are separated from stationary parts and the materials being fabricated. The worker is able to see his job better. Eye fatigue, so often the cause of lowered efficiency, is lessened. Morale-building colors improve the worker's mental attitude toward his job. Safety colors warn him of danger areas and reduce accident hazards.

● **If you want your students** to be equipped thoroughly for their future tasks, begin now to teach COLOR DYNAMICS in your school. Better still—demonstrate its principles in a practical manner. Apply them in the decoration of your classrooms and equipment—and see the difference.

FREE—Color Engineering Study of Your Classrooms

● **Should you desire** a color engineering study of your classrooms—we'll be glad to make one *free* and without obligation. There's a COLOR DYNAMICS expert at each of our offices in principal cities. A call will bring a representative at your convenience. Or send this coupon.

Mail this coupon for FREE BOOKLET!

Pittsburgh Plate Glass Co., Paint Div., Department IA-31, Pittsburgh 22, Pa.

☐ Please send me a FREE copy of your new revised and enlarged Booklet, "*Color Dynamics In Industry.*"

☐ Please have your representative call for a Color Dynamics Survey of our properties without obligation on our part.

Name _____

Street _____

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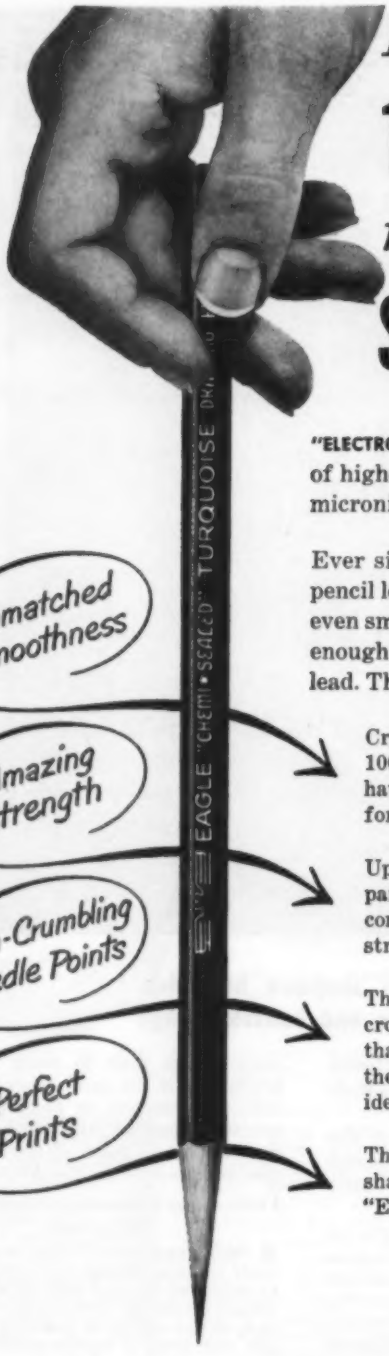

Here's why

100% "Electronic" Graphite

makes the new Turquoise

Serve You Still Better

"ELECTRONIC" is Eagle's trade name for a blend of crystalline graphites of highest purity from Madagascar and Ceylon, reduced to particles of micronic fineness in our patented Attrition Mill.

Ever since we tested our first pound of "Electronic" graphite in fine pencil leads and found how much they were improved by the addition of even small amounts, we have planned for the day when we could process enough of this super-graphite to use it 100% in every TURQUOISE lead. That day has come! Here's what it means on your drafting board:

Unmatched Smoothness

Crystalline graphite is nature's perfect lubricant. Leads made with it 100% have a frictionless, smooth-gliding quality impossible in leads having the usual content of amorphous graphite which contains harsh foreign materials.

Amazing Strength

Upon reduction, the graphite crystals break down into microscopic particles of infinitely varied, close-interlocking shapes. The clay binder completes an extremely dense ceramic structure . . . the strongest lead structure ever achieved.

Non-Crumbling Needle Points

The particles of "Electronic" graphite are so fine that millions more crowd into the air spaces in the lead, producing a richer, tighter lead that deposits more particles, more evenly, at every stroke. That's why the new TURQUOISE lead holds a needle point better than ever and is ideal for long, even lines.

Perfect Prints

The finer the particles of crystalline graphite, the blacker, denser and sharper is the line deposited on the paper. Drawings made with 100% "Electronic" graphite reproduce to perfection.

PROVE IT YOURSELF
Order TURQUOISE today from your dealer. Or write us for a sample in any degree you desire.

EAGLE PENCIL COMPANY
NEW YORK • LONDON • TORONTO

EAGLE
TURQUOISE
WITH 100% *"ELECTRONIC" GRAPHITE

(Continued from page 30A)

d) Strips, 1/32 in. and 3/16 in. thick, 1/2 in. to 1 1/2 in. wide, 50 ft. to a coil, selected sizes
e) Threaded rods, Nos. 6 to 10, in 24 in. lengths. Nos. 12, 14, 1/4 in., and 5/16 in., in 24 in. lengths, selected sizes
f) Wire, soft, 8, 11, and 14 American gauge, selected sizes
g) Wire, spring, 8 to 22 American gauge, selected sizes

CASEHARDENING COMPOUNDS

CHAPLETS — single and double head

COAL
a) Charcoal for foundry or forge
b) Coke for foundry
c) Forge

COPPER
a) Pigs, for casting alloys
b) Sheets, 8 to 25 American gauge, 30 in. by 60 in., selected sizes
c) Tubing, outside diameters, 3/16 in., 1/4 in., 5/16 in., 3/8 in., 1/2 in.; thickness of wall, 1/32 in.; lengths, 8 ft. to 12 ft., selected sizes
d) Wire, soft, 2 to 20 American gauge, in coils. Also in 1/4, 1/2, and 1 lb. spools, sizes 16 to 36, English gauge, selected sizes

CORE
a) Compounds
b) Flour
c) Paste
d) Oil
e) Wax-vent wire

CUTTING COMPOUNDS

FIREBRICKS AND CLAY — for foundry

FIRE HANDLES — assorted sizes

GRAPHITE — for foundry

IRON — pig, for foundry

LACQUER — transparent and colored, for finishing

NUTS — S.A.E., acorn cap, castellated, square, hexagon, joint, and wing, selected sizes and kinds

OIL
a) Boiled linseed
b) Lubricating
c) Quenching and hardening

PACKING
Round, sheet, square, or tubular

PAINT — black asphaltum

PINS
a) Cotter, 3/32-in. to 1/4-in. diam. from 1/2 in. to 2 in. long
b) Flask, for flask repairs
c) Taper, Nos. 0 to 6, 3/4 in. to 2 in. long

PUMICE POWDER

RIVETS
a) Copper, with burrs, Nos. 7 to 14, lengths, 3/8 in. to 3/4 in., selected sizes
b) Iron, No. 14 gauge to 3/16 in., flathead or button head, 1/4 in. to 1 in. long, selected sizes
c) Tinners', flathead, 8 oz. to 16 lb., either tinned or black, selected sizes

SAND
a) Molding, in 350-lb. barrels or 800-lb. casks
b) Parting, in 350-lb. barrels or 800-lb. casks

SCREWS
a) Flathead or roundhead iron brass, selected sizes and kinds
b) Cap and machine, iron or brass, selected sizes and kinds
c) Set, head and headless

SOLDER — acid or rosin core; bar, or solid wire

SOLDERING PASTE OR SALTS

STEEL
a) Bessemer, rod, 1/64 in. to 3/8 in. by 64ths, in 4-ft. lengths, selected sizes
b) Bars, cold rolled, 1/8 in. to 3/8 in. thick, 1/2 in. to 2 in. wide, 12-ft. lengths, selected sizes
c) Drill rod, letter sizes, A to Z, number sizes, 1 to 80, in 3-ft. lengths, selected sizes
d) Rods, hexagon and square, cold rolled, 1/4 in. to 3/4 in., in 12-ft. lengths, selected sizes
e) Round, cold rolled, diameters 1/8 in. to 1 in., lengths 12 ft., selected sizes
f) Sheet, black, Nos. 18, 20, 22, 24, 26, 28, U. S. gauge; size of sheets, 24 in., 28 in., and 30 by 96 in.
g) Sheet, galvanized, Nos. 18, 20, 22, 24, 26, 27, and 28 U. S. gauge; size of sheets, 24 in., 28 in., and 30 by 96 in., selected sizes
h) Threaded rods, Nos. 6 to 10, in 12-in. lengths, Nos. 12, 14, 1/4 in., and 5/16 in., in 24-in. lengths, selected sizes

TIN
a) Pigs, for casting alloys
b) 1C, 1X, 20 by 48 in.
c) 1XX, 20 by 48 in.

WASHERS AND BURRS
a) Copper burrs, Nos. 3 to 14, in 1-lb. boxes
b) Iron burrs, Nos. 3 to 14, in 1-lb. boxes
c) Brass washers, 3/16 in. to 1/2 in. by 16ths
d) Iron washers, 3/16 in. to 1/2 in. by 16ths

WELDING FLUXES

WELDING RODS (all rods come in 24-in. lengths)
a) Brazing, 1/16-in., 1/8-in., and 3/16-in. diameter
b) Cast aluminum, 3/16-in., 1/4-in., and 3/8-in. diameter
c) Cast brass, 3/16-in., and 3/8-in. diameter
d) Cast bronze, 1/4-in. diameter
e) Cast copper, 3/16-in. and 1/4-in. diameter
f) Cast iron, 3/16-in., 1/4-in., 5/16-in., and 3/8-in. diameter
g) Low carbon steel, 1/8-in., 3/16-in., and 1/4-in. diameter

WHITE LEAD — for machine shop

WIRE
a) Annealed, 16 to 34 W and M gauge, selected sizes
b) Coppered market, 5 to 18 W and M gauge, selected sizes
c) Coppered spring, 2 to 18 W and M gauge, selected sizes
d) Galvanized, 5 to 18 W and M gauge, selected sizes
e) Piano, Nos. 2/0 to 36, selected sizes
f) Tinned, 16 to 24 W and M gauge, selected sizes
g) Wool, Nos. 0 to 3 in 1-lb. packages, selected sizes

ZINC
a) Pigs, for casting alloys
b) Sheet, Nos. 4 to 14, sheets 36 in. by 84 in.

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HINTS TO INDUSTRIAL-ARTS CADET TEACHERS

LOUIS NISGORE

Department of Industrial Arts Education
The Bensonhurst Junior High School
Board of Education
New York City

The writer, since September, 1948, has been serving as a master teacher of industrial arts, in co-operation with The Oswego Teachers College of Oswego, N. Y.

Every nine weeks the college assigns a cadet teacher to the master teacher where he devotes all his time to get a bird's-eye view of teaching. The cadet during this time does not take any courses, except that he reports every day to the school where he is assigned.

As a result of this program, the master teacher is really the one who observes the cadet daily and is in a position to judge his success or failure.

These suggestions were compiled for the benefit of the cadet teachers who come under the writer's supervision. It is hoped that the beginning teacher will find something in these suggestions to help him to be happy in his work.

1. If things go wrong, don't become flustered, but seek the advice of your master teacher, supervisor, or principal.

2. How well you enjoy teaching often depends on whether you have had enough rest the night before.

3. Don't be hasty in discipline. Often the case is not so bad when you have studied or slept on it overnight.

4. Always keep on hand a few books or magazines on education. Get these from the public library or borrow one from time to time from someone in your school. Before making your plans for the week, read a chapter or an article. You will find that these will keep you supplied with ideas for your teaching.

5. Don't threaten to do things unless you intend to fulfill your threats.

6. Plan your lessons so that you will teach the important things. Let the details go.

7. Praising pupils will make them work harder than if you had scolded them.

8. Be firm and strict at the beginning. You can unbend later.

9. Make your demands high. If you accept any kind of workmanship, you will get it.

10. Let your pupils enjoy life through you. Open up their minds to new fields.

11. Order comes before *good* teaching. I have seen some new teachers present perfectly wonderful lessons while some of the students were just about rolling in the aisles. Keep your eyes and ears open, and remember, have good order first.

12. Do not expect too much of students. They are younger and have less experience than we realize.

13. Get the current of the class to work with you. Put all that energy to work in the right direction.

14. Remember that a teacher is not just a hearer of lessons. Teach your class so that the pupils learn the subject. See to it that most pupils participate during a lesson.

15. Make it evident that you expect the best of pupils, not only in work, but also in courtesy.

16. Be fair in regard to conduct. Don't let a favorite pupil do anything that you would not allow others to do.

(Continued on page 36A)

LOGAN "955" 11" LATHE

The 955 equips the metal working teacher to train the student in every type of lathe operation. With 1" collet capacity, 1⅜" spindle hole, 11" swing and center distances of 24" or 36", this lathe handles sizeable work *accurately*. Less than .0005" spindle runout 12" from the bearing; and a two-V-way, two-flat-way bed precision ground to within .0005" maximum variation are typical of the tolerances to which it is built. The 45 to 1500 rpm speed range of the ball bearing mounted spindle permits all operations from roughing to high speed carbide tool cutting. Completely enclosed headstock, countershaft and motor means maximum safety for the student. The 955 is ruggedly built for hard school shop use. Its trim, compact steel cabinet is ideal for multiple installations. No other lathe of comparable specifications is comparable in low initial cost. Write now for full information.

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1" Collet Capacity
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Zero Precision Bearings

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INDUSTRIAL-ARTS CADET TEACHERS

(Continued from page 34A)

17. Be human. Don't be too demanding.

18. Rotate your shop personnel assignments frequently, so that each student will have a feeling that he has made a contribution. This tends to upgrade students and gives them a feeling that they are part of the group.

19. If a pupil asks a question which you do not know how to answer, don't be afraid to say that you can't answer it. Try to figure out with the pupil the best means of going about finding the answer.

20. Don't be late in the morning. Have a few minutes before the day begins to think over what you are going to do.

21. During your free periods, occasionally visit classes in your own building. You will get as much inspiration as you would in traveling to another town, and you will see your pupils in another environment.

22. Nearsightedness or deafness sometimes is the cause of poor attention or failure. Talk to each pupil individually, and find out what his trouble is.

23. The shop does not have to be absolutely quiet for good discipline. There are two kinds of noise: busy noise and noisy noise.

24. Use as many time-saving devices as possible.

25. If a pupil is a disciplinary problem, ask him to do something for you. Let him see that you greatly appreciate his help, and he no longer will be a bother.

26. Make your shop cheerful and attractive.

27. Failure of pupils is often the fault of the teacher to motivate the lessons. In case of a failure analyze your teaching methods.

28. Keep a progress chart for each shop class, so that the pupils will have a feeling that you are interested in what they do in your shop. It will also keep them posted on how they are getting along in their work.

29. In life, activities and interests vary. Do not have all the pupils in your shop class do the same thing at the same time.

30. Be loyal to your superiors and your school.

There are many more suggestions that might be given to a new teacher, but these are the ones that stand out like a traffic blinker on a congested highway. They are intended to make life easier and give the teacher a better start.

ENGLISH FOR TRADE AND VOCATIONAL SCHOOLS

J. ALLEN MORRIS
Murray Vocational School
Charleston, S. C.

(See preceding articles in January, September, and November, 1948; January, May, June, November, and December, 1949; February and November, 1950; and February, 1951, issues)

Subject-Verb Work

Closely related to mistakes in forming plurals of nouns and past tense and past participial forms of regular verbs are errors in agreement of subject and verb. For several reasons this is a complicated, difficult teaching problem: most vocational school students have no workable understanding of subjects and verbs, do not know any rules, and are unable to find mistakes in their work without an instructor's assistance. Individual differences play an important part in making the problem harder to solve satisfactorily, for the boys in any average class vary con-

(Continued on page 38A)

May I start by introducing myself? As you can see from the title, they call me Sparky. I'm what you might call a trade character and I serve as official spokesman for Marquette products.

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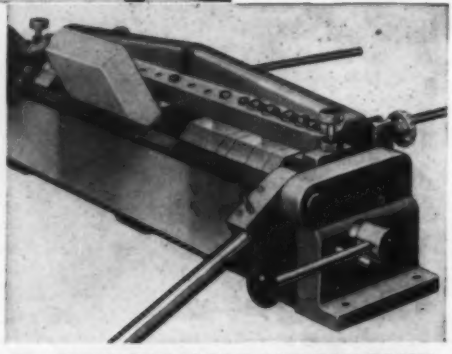

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ENGLISH FOR TRADE AND VOCATIONAL SCHOOLS

(Continued from page 36A)

siderably in their background knowledge.

As even good students need some help with subject-verb agreement, the best plan seems to be to start at the bottom and work up — from the simplest fundamentals to fairly difficult rules and principles. I start by asking for a definition of the word "subject," realizing that I shall receive the traditional (and, to my students, worthless) answer: "The subject is what you are talking about." Technically this is correct, but it is valueless to beginners who cannot find the subject in any sentence containing several nouns and pronouns.

To start the discussion, I put on the board several sentences containing prepositional phrases, like these:

1. For two dollars he sold his watch to a man in a filling station.
2. At the show in the Gloria Theater we saw many interesting things.

After giving students time enough to pick out the subjects of these sentences, I ask for volunteers to name the subjects. At once the wrong answers start coming in: "dollars," "watch," "man," "filling station," "show," "theater," "things." Occasionally the correct subjects, "he" and "we," are offered by students who know something about subjects. The others simply guess at a word that fits the loose definition "what you are talking about."

Next I suggest the word *doer* (the person, place, or thing that does, did, or will do something) as a simple definition for *subject*. Actually this is not a perfect definition, for there are verbs that do not show action; but for all practical purposes "doer" helps to explain the nature of the word *subject* to boys who cannot otherwise understand it. In the sentences used as examples *he* is the *doer* of the selling (sold) and *we* is the *doer* of the seeing (saw); therefore these are the subjects of sold and saw.

Having made this point clear, I take up one more idea: the difference between a *singular verb* and a *plural verb*. To begin this instruction I put several verbs on the board: is, work, plays, are, do, has, does, have. Students are told to look at each verb and decide whether it is singular or plural. As the guessing begins, the class is usually divided almost evenly — half right, half wrong. As soon as the boys realize that guesswork is useless, I write on the board, to be copied in notebooks, the sentence: "A singular verb ends in the letter *s*." I then show them that "is," "plays," "has," and "does" are singular verbs ("because they end in *s*") and "work," "are," "do," and "have" are plural verbs ("because they don't end in *s*"). To show the connection between each subject and its verb, I write singular subjects before the singular verbs and plural subjects before the plural verbs. This is about all that a group can take in at one time. At the end of the instruction period a short drill should be given so that the boys can secure practice in consciously making subjects agree with verbs. Sentences like these are satisfactory for this:

1. It (don't, doesn't) cost very much. 2. The tools (was, were) rusty. 3. The airplanes (is, are) taking off. 4. The boys (has, have) gone out. 5. This drill (don't, doesn't) work well. 6. We (was, were) talking about you. 7. You (know, knows) the answer. 8. It (cost, costs) too much. 9. They (was, were) at the game. 10. He (make, makes) mistakes often.

(Continued on page 41A)

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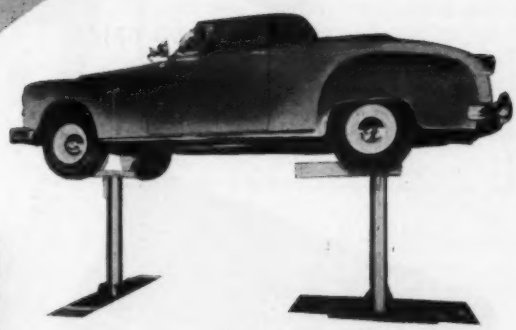

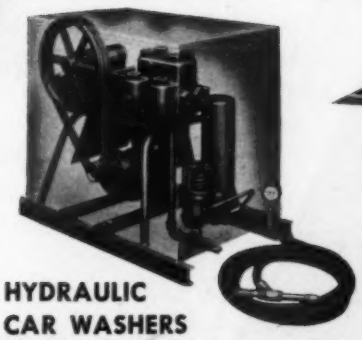

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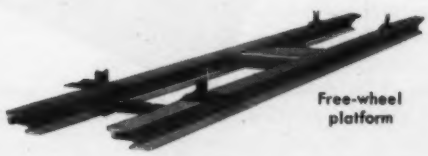

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ENGLISH FOR TRADE AND VOCATIONAL SCHOOLS

(Continued from page 38A)

Later additional simple drill sentences like these can be used for testing:

1. (Was, Were) you at the picnic last week? 2. It (doesn't, don't) make sense. 3. We (was, were) too tired to walk back to the camp. 4. The yacht (was, were) sunk by the high seas. 5. John (has, have) a fine set of drafting instruments. 6. They (don't, doesn't) want to do their work properly. 7. The hammers (was, were) rusted. 8. The man (is, are) trying to get a job. 9. The boy (make, makes) model airplanes for fun. 10. The girls (make, makes) fudge for the parties.

The instructor can continue working on drills like these until he knows that his students understand enough about this form of subject-verb agreement and are ready for a useful small addition: the use of a plural verb with the pronoun *you*. Conscientious students, in an effort to apply the first rules learned, write *you was, you does*, etc. They quickly learn that a plural verb (one that does not end in *s*) should be used with *you*, whether it is singular or plural. After learning this rule, each boy should practice using it correctly, writing a few sentences like these:

1. (Was, Were) you with your father last night, Jack? 2. (Do, Does) you think it will rain before we get home? 3. (Is, Are) you sure that he took your bicycle? 4. (Is, Are) you going to the dance tonight? 5. (Have, Has) you ever seen a submarine?

Additional drills, similar to the following sentences, can be used later as needed:

1. (Was, Were) you with him yesterday, Jim? 2. (Do, Does) you know who took that chisel from the bench a few minutes ago? 3. (Is, Are) you ready to leave yet? 4. Jack, (is, are) you going to the game Friday night? 5. (Has, Have) you an extra wrench, Tom?

These are *required learning* for our first-year students; they furnish a good foundation for the work of the next grade, in which work on compound subjects begins. The word *compound* needs explanation, for it means little or nothing to the average boy at first.

The instructor can put on the board the following definition for students to copy in their notebooks:

A *compound* is something made up of several things added together.

A compound subject is one subject added to another subject.

A compound subject is plural (more than one) and takes a plural verb (a verb not ending in *s*).

Examples:

John and Tom are in the wood shop.
(two boys)....are (plural verb)

The hammer and the chisel were lost.
(two tools) ..... were
(plural verb)

This should be followed immediately by drill work, using sentences of this sort:

1. the chevrolet and the ford (was, were) in a wreck. 2. the machine shop and the auto shop (help, helps) boys to learn practical trades. 3. a carpenter and an auto mechanic (has, have) been fired for loafing. 4. joe s bicycle and tom s car (is, are) being repaired. 5. murray vocational school and charleston high school (is, are) schools for boys in charleston s c 6. january and february (is, are) two months of the year. 7. mary and john (play, plays) tennis every afternoon. 8. the coach and the manager (arrange, arranges) programs for the

(Continued on page 42A)

— *never before such a blade*

in a professional plane at a budget price.
*Precision ground from vanadium tool steel.

The Hercules Golden Cutter Plane has 12 certified advantages, including large brass nut for easy adjusting, steel spring under clamp toggle, genuine hardwood knob and easy grip handle.

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Builders Hardware and Fine Tools since 1864

ENGLISH FOR TRADE AND VOCATIONAL SCHOOLS

(Continued from page 41A)

athletic season. 9. frank and bill (has, have) not returned from their trip yet. 10. the teachers and the principal (give, gives) recommendations for jobs.

Similar drills should be given later — until the instructor is sure that students can recognize compound subjects and use plural verbs with them. Blocks of sentences like these are easily prepared:

1. the book and the pencil (is, are) still on the table 2. a tack and a piece of glass (was, were) found in the old box 3. the salesman and the clerk (has, have) been fired for stealing 4. tom and john (was, were) planning to go on a hike 5. snow and ice (cover, covers) the pavements

Later, still another troublesome point needs some attention. Almost all students occasionally use sentences beginning with *here* and *there*. Many boys think that these words are singular subjects and accordingly write sentences like "There is several ships in the harbor" and "Here is your tools." The instructor should explain that these words are *dummy subjects* — not real subjects at all — and that they have no effect on verbs. A few examples on the board with a brief explanation will show how the real subjects come after the verb. Students need to watch for sentences beginning with *here* and *there* so that they can make the verbs agree with the subjects. They should copy from the board for their notebooks a short rule like the following:

> Two words which are not used as subjects are *here* and *there*. When these words start sentences, the subjects come after the verbs. Notice the following sentences:
> Here is the *book*. (The subject is *book*.)
> There are the *chisels*. (The subject is *chisels*.)

During the second year, students are required to learn these two rules (in addition, of course, to the work of the first year). In the junior year the most difficult rules are studied. By this time boys are able to recognize prepositional phrases and are mentally old enough to be interested in removing from their work errors caused by phrases which come between the subjects and verbs. Considerable board work is necessary to explain how phrases must be mentally eliminated when searching for a subject. Sentences like these should be written on the board:

1. All the boys in the school bus (was, were) hurt in the wreck.
2. In the wood shop (is, are) many tools.
3. Each of the girls in the two boats (was, were) afraid.

In two of these sentences (1 and 3) the subjects are separated from the verbs by phrases, and in the second sentence the subject comes at the end of the sentence. Some boys will select *bus, wreck, woodshop, girls, boats* as subjects, not realizing that these words, being objects of prepositions, cannot be subjects. The instructor should draw a line through each prepositional phrase, stressing the idea that a word in a prepositional phrase cannot be a subject. If the class needs work on prepositional phrases in order to understand the instruction, some drill work on phrases should be given at this point. Students should copy for their notebooks a list of commonly used prepositions (about, above, across, after, against, along, among, around, at, before, behind, below, beside, between, by, down, during, except, for,

(Continued on page 44A)

SPECIFY Hotpack EQUIPMENT

For Long Satisfactory Service

Look at These Features and Compare

Hotpack ELECTRIC CERAMIC KILNS

Designed for Use in Art Courses in the School — TWO LINES — Regular & Automatically Controlled

1. Eye level controls — pilot light.
2. Built-in pyrometer for visible accurate temperature indication.
3. Handles are cool to touch.
4. Control switch — low, medium and high heat for even distribution.
5. Special insulation holds heat and prevents scorching of table top.

INSULATION: The firing chamber is heavily insulated with five inches of high temperature insulating brick, including the door of the Kiln. To further insure against heat loss through the side walls of the firing chamber, each brick is tongued and grooved, so that there is no possibility of through joints to the outer wall.

This unique construction, although more costly than usually supplied with this type of unit, permits the brick insulation to expand and contract while the Kiln is being fired, without developing through cracks or breakdown of the walls and ceiling, that formerly occurred.

SAFETY: In addition to the usual electrical precautions required by the National Electrical Code and U. S. Underwriters' Laboratories, we have built into the HOTPACK Kiln a Safety Locking Device to insure against the possibility of injury to either pupil or patient, who may accidently open the Kiln door, during the period it is being fired. This arrangement for a padlock will prevent the door of the Kiln being opened by anyone other than the operator.

SPECIFICATIONS

Model No.	Interior Size	Cubic Inches	Shelves Furnished	Max. Temp.	Approx. Time	Electrical Characteristics
7006	8"x 8"x 5½"	352	1	2050° F.	3 hrs.	115 V-15 Amp.-1700W
7004	8"x 8"x11"	704	2	2050° F.	4 hrs.	115 V-15 Amp.-1700W
7005	12"x12"x11"	1584	2	2050° F.	3 hrs.	220 V-23 Amp.-5000W
7007	15"x15"x16½"	3613	3	2050° F.	4 hrs.	220 V-30 Amp.-6600W
7009	12"x12"x 5½"	792	1	2050° F.	4 hrs.	115 V-15 Amp.-1700W

MANUALLY CONTROLLED			AUTOMATICALLY CONTROLLED	
Model No.	Ship. Wgt.	Price F.O.B. Phila.	Model No.	Prices F.O.B. Phila.
7006	180 lb.	$ 65.00	7006 A	$160.00
7004	200 lb.	$ 95.00	7004 A	$190.00
7005	350 lb.	$205.00	7005 A	$305.00
7007	550 lb.	$410.00	7007 A	$495.00
7009	250 lb.	$105.00	7009 A	$210.00

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EVERYTHING YOU NEED TO MAKE THIS PROFESSIONAL LOOKING ELECTRIC KILN

LARGE CHAMBER: 12" deep, 11" wide, 9" high

YOU GET: Illustrated instruction Manual, Insulating Back Up Material, Insulated Cover & Handle, Wire — Screws — Terminal Board, Insulating Brick — cut to size, Sheet metal case — Welded & Painted, Hotpack Heating Elements, wired 15 Amps — 115 volt — Ready to install.

Prices including Freight and Crating:
East of Denver — $48.00
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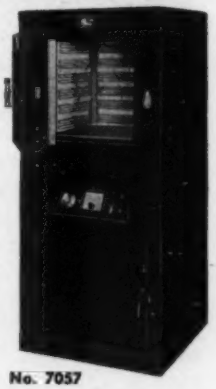

No. 7057

For Hardening, drawing, tempering and annealing or normalizing of dies, punches, gages, fixtures or other parts are performed readily with these redesigned Hotpack Electric Box Furnaces.

This new Hotpack Electric Furnace is fast heat-built for continuous use from 300° F. to 2000° F. It is the only Furnace equipped with Automatic Controlling-Indicating Pyrometer and also with Limitstat control in this price field.

SPECIFICATIONS

Model	Interior Size W. D. H.	Current Characteristics	Shipping Weight	Price F.O.B. Phila.
7056	8"x 8"x 5½"	110 V-AC-15 Amp.	180 lbs.	$160.00
7054	8"x 8"x11"	115 V-AC-15 Amp.	200 lbs.	$190.00
7055	12"x12"x11"	220 V-AC-23 Amp.	350 lbs.	$305.00
7057	15"x15"x16½"	200 V-AC-30 Amp.	550 lbs.	$495.00

009 "9N

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ELECTRIC PORTABLE OVEN

For preheating Methyl Methacrylate in sheet or rod form where it is necessary to maintain even temperature throughout the sheet, especially desirable in compressed air, vacuum or pressure forming techniques.

The Oven is controlled by a newly developed thermostatic control, sealed in and conveniently placed on the front panel, of the Oven. It can accurately be set at any desired temperature where a quick rate of heat up to 360° F. is desired.

Due to the Aluminum Construction, the Oven is very light in weight and can be carried from room or project to project. As it operates on 110 volt AC or DC, it can be plugged into any 110 volt receptacle.

SPECIFICATIONS

Model	Interior Size	Exterior Size	Wattage 110V AC-DC	Shipping Weight	F.O.B. Phila. Price
601	12"Wx12"Dx12"H	16"Wx19"Dx24"H	700	60 lbs.	$ 75.00
602	24"Wx12"Dx12"H	28"Wx19"Dx24"H	1400	110 lbs.	$125.00

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Designed for Use in Plastic Courses in the School

The HOTPACK PLASTIHEETER is a commercial type strip heater designed to heat sheets of Plexiglass or Lucite until they become soft and pliable for shaping to the form desired. It is essentially used for straight line bends or folds and is capable of heating sheet material up to ½" thickness in from 30 seconds to 4 minutes depending on the thickness of the material. As the material does not come into contact with the heating element and the platen remains cool, there is no possibility of creating mark-off on the sheet.

No. 15

SPECIFICATIONS

Model No.	Working Space	Overall Size	Wattage 115 Volt	Shipping Weight	Price F.O.B. Phila.
15	18"Lx5"Wx2½"H	21"Lx7"Wx3½"H	200 W	4 lbs.	$15.00
16	30"Lx5"Wx2½"H	32"Lx7"Wx3½"H	350 W	6 lbs.	$25.00

THE ELECTRIC Hotpack COMPANY, INC.

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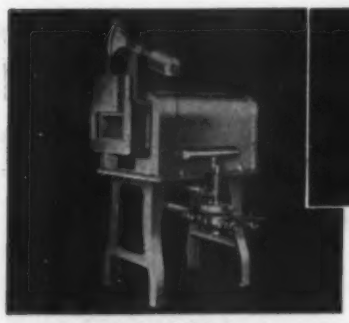

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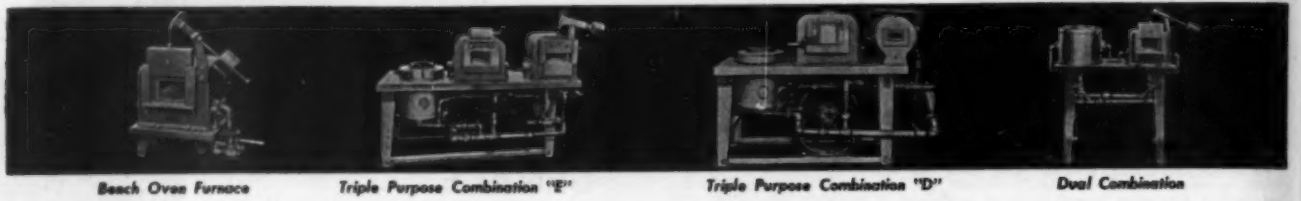

Bench Oven Furnace — Triple Purpose Combination "E" — Triple Purpose Combination "D" — Dual Combination

ENGLISH FOR TRADE AND VOCATIONAL SCHOOLS

(Continued from page 42A)

from, in, into, near, of, off, on, over, since, through, to, toward, under, until, up, upon, with, within, without). At least six of these (in, on, of, by, with, from) should be memorized by each student.

When students are able to recognize phrases, the instructor should show how they cause errors in subject-verb agreement. In many sentences the subject is singular and should be used with a singular verb; but if a phrase comes between the subject and the verb, the plural object of the preposition is often mistaken for the subject, producing sentences like "A line of soldiers were standing in front of the theater" and "Each of the boys are working." After a little practice most boys can learn to reject phrases when looking for subjects. A review of the "subject-doer" idea is helpful in connection with this work.

Here, also, drill work is essential. Sentences like the following should be done for practice as soon as the explanation has been completed:

1. Every boy in the three classes (has, have) a job. 2. All the men in the factory (work, works) hard. 3. The tools on the workbench (is, are) too dull. 4. The prices on the window (was, were) written with soap. 5. The boxes from his mother (has, have) arrived. 6. The money from the banks (is, are) coming in armored trucks. 7. Several books by the same author (was, were) read by the boys. 8. The man with the cauliflower ears (is, are) a boxer. 9. In the drawer of the workbench (is, are) the chisels. 10. The keys on a typewriter (is, are) not easily broken.

For additional practice, other sentences such as these should be assigned later:

1. The books for the library (has, have) come in at last. 2. In plain sight upon the table in the hall (was, were) the papers. 3. Down at the bottom of the pit (was, were) three rattlesnakes. 4. The car with the broken headlights (don't, doesn't) run well. 5. One of the cutting tools (is, are) no good. 6. The box of tools (has, have) been found. 7. The teeth of a horse (shows, show) its age. 8. The story of the captain about the shipwrecks (was, were) exciting. 9. The father of the children (has, have) been awarded a medal. 10. The men of this shop (is, are) well paid.

The least important and most difficult work should be started only after the instructor feels that his students know and can use correctly in drill work the rules previously studied. As most boys know nothing about this new material, the instructor can start by having students copy for their notebooks the following:

BODY words:

All words that end in *–body* are singular and should be used with verbs ending in *s*: everybody, anybody, nobody, somebody.

Examples:

Everybody *has* put away his tools.

If anybody *comes* to see me, tell him to wait until I return.

Nobody *knows* what the signals mean.

Somebody *has* left his hammer lying on the workbench.

EACH, EVERY, EITHER, NEITHER

The following words are singular and should be used with singular verbs (ending in *s*):

Each (meaning "each one")
Every (meaning "every one")
Either (meaning "either one")
Neither (meaning "neither one")

As these are particularly troublesome,

(Continued on page 46A)

NEW NO. 1950 BIT BRACE with unbreakable head and handle of glossy red Tenite.
NEW NO. 714 BENCH PLANE. 14-inch colorful streamlined with many unique features. Also made in 9-inch model No. 70½.
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NEW 2-SPEED, 100° ANGLE NO. 2120 Buffing and Sanding Attachment. Fits any ¼-inch electric drill.
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GENERAL ELECTRIC

687-65

ENGLISH FOR TRADE AND VOCATIONAL SCHOOLS

(Continued from page 44A)

they require considerable explanation and practice, the instructor working sentence after sentence with the class until the boys know enough to work by themselves. For board work the following sentences illustrating the use of *body* words are useful:

1. Everybody in the five classes (was, were) at the game.
2. Nobody in the two school buses (know, knows) how to drive.
3. Somebody in this room (has, have) Bill's watch.
4. If anybody (need, needs) a pencil, Jack will lend him one.

Additional drill sentences can be assigned later, composed of sentences like these:

1. If anybody (come, comes) in late, he is kept in after school.
2. Nobody in the city (want, wants) to have taxes raised again.
3. Everybody in the school (was, were) glad to get out early.
4. Somebody in the five shops (know, knows) who broke the window.

For board work explanation of *each, every, either,* and *neither,* sentences like these can be used:

1. Each of the boys (is, are) hurt. 2. Neither of the two boys (was, were) ready to go. 3. Every one of the boys (has, have) a good record in shopwork. 4. I don't think that either of these cars (is, are) ready for a road test yet.

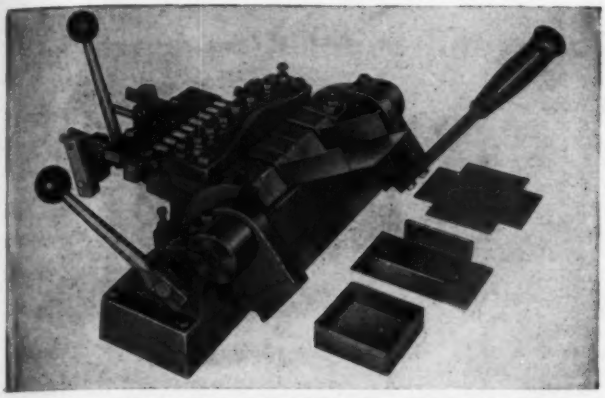
Similar sentences, like the following, should be used later for testing purposes:

1. Neither of the two men (was, were) in good condition for the fight. 2. Each of the ten men (has, have) received an increase in pay. 3. He says that either of these lathes (is, are) ready for the next job. 4. Every man in the country (want, wants) to have some money of his own.

Knowledge of rules, instructor's instructions and explanations, and practice drills are necessary and helpful; but they will not stop students from making errors in their written work. Some sort of penalty must be used for careless boys who know better, yet continue to use plural verbs with singular subjects and singular verbs with plural subjects. For such students I use "make-up work": writing a number of times the form that should have been used. For instance, if a boy carelessly writes, *"You was* in the service for three years, *wasn't you?"* or "All the *boys has* checked in their tools," he is required to write "you were" and "were you" or "boys have" several times (5–10–20–50–100) in accordance with the amount of trouble he has previously had with errors in subject-verb agreement. Before he starts to do this make-up work, I discuss the rule with him to be sure that he understands it while correcting it. For schools which do not use an individual work-card system, a standard number of times (10 or 25) can be substituted for the ascending scale I use.

Other rules of subject-verb agreement can be taught if an instructor wishes to go beyond the level of work discussed here, but for average vocational school students these are sufficient. Mastery of these will take care of all normal afterschool needs so far as subject-verb agreement is concerned.

The United States needs to stimulate vocational opportunities if our economic way of life is to survive. . . . *Dr. M. Norcross Stratton, Massachusetts State Director of Vocational Education.*



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- ☐ MACHINE WOODWORKING — Smith. Revised 1948.....$3.00
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- ☐ GENERAL DRAFTING — Frykiund & Kepler. Revised 1949. For beginners $1.25
- ☐ PROBLEMS IN DRAFTING AND DESIGN — Goff. 50 problems for beginners and advanced students $1.00
- ☐ DRAWING APTITUDE TEST — Mitchell. Specimen set.....$ .35
- ☐ SPUR GEARING — Owen Elements of gear design.....$1.00
- ☐ METALWORK, TECHNOLOGY & PRACTICE — Ludwig. Complete textbook $4.40
- ☐ GENERAL SHOP METALWORK — Dragoo & Reed. Basic text...$1.25
- ☐ UNITS IN SHEET METALWORK — Smith. First Course, short units.$1.00
- ☐ UNITS IN BENCH METALWORK — Smith. Elementary bench work.$1.00
- ☐ UNITS IN ETCHING, SPINNING, RAISING AND TOOLING METAL — Smith $1.00
- ☐ UNITS IN PATTERNMAKING & FOUNDING — Smith. First course. $1.00
- ☐ UNITS IN FORGING & WELDING — Smith $1.00
- ☐ GAS & A.C. ARC WELDING & CUTTING — Jennings. Elementary for use in school shop.....$1.25

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Dept. 83, Market and Center Sts., Bloomington, Ill.

Automotive Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

AIR COMPRESSOR
- *a*) 3 to 4 cu. ft., with tank, piping, and motor
- *b*) Small portable, 1 cu. ft., with motor

ALIGNING JIG — for connecting rods

ANVIL
- *a*) No. 100 or No. 125
- *b*) Rim

ARMATURE GROWLER AND TESTER

AXLE STANDS

BATTERY EQUIPMENT
- *a*) Cell tester, panel type with discharge rack
- *b*) Charger (15-battery size) with rack
- *c*) Charger (6-battery size)
- *d*) Gas stove (small)
- *e*) Lead-burning torches, with gauges and piping
- *f*) Plate racks

BENCH
- *a*) Electric test, elaborate
- *b*) Electric test, simple
- *c*) Work, with vises
- *d*) Work, portable with vise

BLACKBOARD

BLOWTORCHES — 1-qt. size

BOOKCASE

BRAKE
- *a*) Adjusting stand
- *b*) Band-lining machine

BULLETIN BOARD

CABINETS
- *a*) Wood or metal, for bolts and supplies
- *b*) Wood or metal, for filing job sheets and correspondence

CHAIN HOIST — with overhead trolley and track

CHAIRS
- *a*) Teacher's
- *b*) For tables, or with tablet arms

CRANE — portable

CRANKSHAFT TRUING TOOL

CREEPERS

DESK — teacher's

DRILL
- *a*) Breast
- *b*) Hand
- *c*) Electric portable, ½ in.
- *d*) Electric portable, ¼ in.
- *e*) Press, 21 in., with motor and chuck

DYNAMOMETER — electric

FORGE — with blower and tools

FURNACES — gas

GREASE DISPENSERS

GRINDER
- *a*) Cylinder, with motor
- *b*) 8 in., with motor
- *c*) 12 in., with motor

HONES — cylinder

JACKS
- *a*) Lever, 1½-ton
- *b*) Floor, roller

LATHE
- *a*) 11 in. by 4 ft., with motor, chucks, and attachments
- *b*) 16 in. by 6 ft., with motor, chucks, and attachments

PRESS
- *a*) Arbor
- *b*) 30 ton

SPRAY PAINTING OUTFIT

VALVE REFACING MACHINE

VULCANIZER
- *a*) Electric steam for tube work
- *b*) Small, hand

WELDING OUTFIT — with tanks, gauges, and cutting torch

WHEEL ALIGNMENT
- *a*) Gauge
- *b*) Test table

Automotive Shop — Small Tools

ABRASIVE — rubstone for cleaning castings in foundry

ALCOHOL TESTER

BATTERY
- *a*) Cell tester, prod type
- *b*) Cell tester, cadmium
- *c*) Clips, large
- *d*) Element pullers
- *e*) Fillers
- *f*) Funnels, glass
- *g*) Hydrometer, acid
- *h*) Knives
- *j*) Post builders
- *k*) Post drills
- *l*) Post markers
- *m*) Separator trimmer

BITS
- *a*) Expansive
- *b*) Ratchet brace
- *c*) Wood, 3/16 in. to 1 in.

BOLT CUTTER — 24 in. and 36 in.

CALIPERS — 6 in. inside and outside

CANS
- *a*) Oil, ½ pt.
- *b*) 1 gal., gas, safety
- *c*) 5 gal., gas, safety
- *d*) 5 gal., kerosene
- *e*) Waste

CHECKS — tool, 1000, blank

CHISELS
- *a*) Cape, 3/8 in. and 5/8 in.
- *b*) Cold, 3/8 in., 5/8 in., ¾ in., 1 in.
- *c*) Diamond point

COMBINATION SQUARES — 12 in.

COTTER-PIN EXTRACTOR

DIVIDERS — 6 in. and 10 in.

DRILL SETS
- *a*) 1/32 in. to ½ in., by 64ths
- *b*) ½ in. to 1¼ in., by 32nds

FILE CARDS

FILE HANDLES — assorted

FILES
- *a*) Flat bastard, 6 in., 8 in., 10 in., and 12 in.
- *b*) Half round, 6 in., 8 in., 10 in., and 12 in.
- *c*) Mill, 6 in., 8 in., 10 in., and 12 in.
- *d*) Round, 6 in., 8 in., 10 in., and 12 in.
- *e*) Square, 8 in., 10 in., and 12 in.

FIRE EXTINGUISHERS — Pyrene and Acid

FIRST-AID CABINET AND SUPPLIES

FLOOR BRUSHES — 18 in.

FUNNELS — tin, assorted sizes

GAUGES
- *a*) Air pressure
- *b*) Center
- *c*) Depth
- *d*) Thread
- *e*) Thickness

GLASS CUTTERS

GOGGLES

GREASE GUNS — plain and pressure type

HAMMERS
- *a*) Ball peen, 4 oz.
- *b*) Ball peen, 1¼ lb.
- *c*) Ball peen, 2 lb.
- *d*) Lead
- *e*) Riveting
- *f*) Sledge, No. 12

LADLE
- *a*) 3-in. bowl
- *b*) 6-in. bowl

LAMPS — extension, with reels

LEAD POT — gas

MAGNET CHARGER

METERS — volt and ammeter test

MICROMETERS
- *a*) Outside, 0 to 1 in.
- *b*) Outside, 2 in. to 3 in.
- *c*) Outside, 3 in. to 4 in.
- *d*) Inside, 1½ in. to 6 in.

MOLDS
- *a*) Battery nut
- *b*) Battery post
- *c*) Battery strap
- *d*) Burning stick
- *e*) Lead hammer

OILSTONE

PIPE TAPS — ⅛ in., ¼ in., ⅜ in., and ½ in.

PLIERS
- *a*) Combination, 6 in.
- *b*) Flat nose
- *c*) Roundnose

PULLERS
- *a*) Bearing
- *b*) Gear
- *c*) Wheel, hub type

PUNCHES
- *a*) Center
- *b*) Taper pin
- *c*) Blacksmith

PUTTY KNIVES

(Continued on page 50A)

FOUNDRY WORK AS AN OCCUPATION

ERNST H. SUERKEN
Supervising Principal
Union Free School District, Greenburgh Number Eleven
Dobbs Ferry, N. Y.

Better than average vocational opportunities are to be found in the foundries of the United States today. The work varies from handling of simple materials, to work in all the fundamental foundry departments, and to highly technical research. The different positions require diffierent skills; some foundry work requires considerable manual dexterity and skill, while others call for imagination and ability to visualize a completed pattern, casting, or model from a blueprint. The foundries also need individuals with a keen appreciation for getting things done, those who like to produce. The requirements of foundries for various workers vary according to size, type of castings made, and other considerations. Foundries make the metal castings which play an important role in everyone's life. Our discussion here will concern itself primarily with the workers and opportunities to be found in the five fundamental departments of the average foundry. One should realize, however, that in some foundries certain types of work are not required and, in others, several types of work may be performed by one individual.

Let us consider the five fundamental departments to be found in most foundries and the type of work that is performed by the workers in each.

The primary department is called the molding department where molds are made either by machinery or by hand. The workers in the molding department are called bench molders, machine molders, pit molders, or loam molders depending on the nature of their work and on the type of molding machine used. The bench

(Continued on page 51A)

up to 50% Greater Earnings

for Mechanics educated to the use of modern, time-saving tools!

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Sounds pretty strong! . . . *until you know the facts.* 30 years of unique, *first-hand* experience with the working mechanics of America have taught us the *facts* . . . given us countless case histories of the miracle that takes place in a man's productivity . . . *and his paycheck* . . . once he "sees the light" . . . and gives himself all the advantages modern tool equipment can provide.

It is a tradition (and a fact) that "good mechanics appreciate good tools."

It is a *far more important fact* that hundreds of thousands of man-hours (and pay-check dollars) are wasted *daily* through lack of the right tools for the job . . . *engineered* tools, fast, safe, energy-conserving, accurate!

Hard to believe *but we have seen* . . . again and again and again . . . young mechanics with brief experience *but excellent tool equipment* swiftly outstrip, in work and pay, able veterans who "didn't need all that stuff."

We honestly wonder if, in the education of tomorrow's mechanic, there is anything more vital to his career—his earnings—his pride-of-craft . . . than to deeply impress on him the importance of a *complete* kit of *quality* tools . . . and to train him with such tools!

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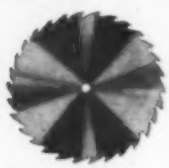
ATKINS keyhole saws



ATKINS circular saws

ATKINS hack saws

ATKINS band saws

When it comes to rugged classroom use — ATKINS *"Silver Steel"* products can *take* it! Not only that, but instructors all over the nation have discovered that these precision instruments improve student work and make teaching easier. There's no doubt about it! No doubt, either, that of all fine saws, the finest are *"Silver Steel"* saws! No saw, regardless of design, can be better than the steel that goes into it. And Atkins *"Silver Steel"* saws are made of the finest, toughest, longest-lasting steel ever compounded for sawing purposes. In addition, their modern design, expert hand craftsmanship, correct tensioning and tempering and their perfect balance give them the "feel" and accurate cutting that inspire better workmanship — in the hands of student and professional alike.

Only ATKINS makes *"Silver Steel"* products

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Branch Offices: Atlanta • Chicago • Portland • New York

THERE IS AN ATKINS SAW FOR EVERY CLASSROOM USE

(Continued from page 48A)

REAMER — spindle bolt
REAMER SETS
- *a)* Piston pin, ½ in. to 1⅜ in.
- *b)* Taper pin
- *c)* Valve seat

SAWS
- *a)* Hack, frames, 10 in., adjustable
- *b)* Hack-saw blades, 18, 20, and 24 teeth
- *c)* Hand

SCALES
- *a)* Steel, 6 in., graduated 1/64 and 1/100 in.
- *b)* Steel, 12 in., graduated 1/32 in.

SCRAPERS
- *a)* Bearing
- *b)* Carbon

SCREW DRIVERS
- *a)* 6 in. and 12 in.
- *b)* Small combination

SCREW EXTRACTORS
SCRIBERS
SNIPS — tin, 3 in. straight and 3 in. curved
SOLDERING COPPERS — 1, 2, and 3 lb. with handles
SPRING SPREADERS
STAMPS
- *a)* Figures, 3/16 in.
- *b)* Letters, 3/16 in.

TAP-AND-DIE SETS
- *a)* Machine screw
- *b)* N.F. ¼ in. to 1 in.
- *c)* N.C. ¼ in. to 1 in.

TIRE TOOLS
TOOL KIT — metal box or canvas roll, empty
TWIST DRILLS — (extra sets) selected sizes
VALVE
- *a)* Grinders (hand)
- *b)* Spring lifters

WRENCHES
- *a)* 8 in., 10 in., 12 in., and 18 in.
- *b)* Ignition sets
- *c)* Pipe, 10 in., 14 in., 16 in., and 18 in.
- *d)* Rim socket
- *e)* Socket sets, large assortment with case
- *f)* Spark plug
- *g)* Speed wrenches
- *h)* Standard end sets, ¼ in. to 7/8 in., N.C. and N.F.
- *j)* Valve-tappet wrenches

Automotive Shop — Materials and Supplies

ABRASIVE CLOTH AND PAPER — aluminum oxide and silicon carbide
ACETYLENE GAS — in drums, for welding
ACID
ALCOHOL
BABBITT
BEARING BLUE
BEARING COMPOUND
- *a)* 600W
- *b)* Penetrating

BOLTS
- *a)* Machine, selected sizes
- *b)* N.F. selected sizes
- *c)* Stove, flat or round heads, selected sizes

BRAKE JUICE — ½-pt. cans
BRUSHES
- *a)* Paint
- *b)* Spark plug
- *c)* Spoke
- *d)* Steel
- *e)* Varnish

CHAMOIS
COIL-SPRING ASSORTMENT
COPPER TUBING
COTTER PINS — assorted sizes
CROCUS CLOTH
DISTILLED WATER
DRAIN COCKS
ELECTROLYTE
ENAMEL — AUTO PAINTING
GASKETS
- *a)* Copper asbestos
- *b)* Cork and felt
- *c)* Flange

GASOLINE
GREASE — cup, cans
KEROSENE
KEYS, WHITNEY — assorted
LACQUER — colors
LEAD
LUBRICANT — transmission
NAILS AND BRADS
NUTS
- *a)* N.F., castellated, square, hexagon, selected sizes and kinds
- *b)* N.C., square and hexagon, selected sizes
- *c)* Machine screw, selected sizes
- *d)* Wing, selected sizes

OIL
- *a)* Cylinder, light, medium, and heavy

OXYGEN — in drums for lead burning
PIG LEAD
PISTON-RING COMPRESSORS
RADIATOR HOSE
RIVETS — brake lining, 5/16 in., ½ in., and ¾ in. long
SCREWS
- *a)* Flathead or roundhead, iron or brass, selected sizes and kinds
- *b)* Cap and machine, iron or brass, selected sizes and kinds

SEALING COMPOUND
SHELLAC — ½-pt. cans
SHIM STOCK
SOAPSTONE
SOLDER — bar, wire, or self-fluxing wire
SOLDERING PASTE
SPELTER — for brazing
SPONGES — ½ lb.
STARTING CABLE
TACKS AND STAPLES — upholstery
TIRE
- *a)* Carcass fabric
- *b)* Cushion stock
- *c)* Inner-tube repair stock
- *d)* Patching cement
- *e)* Patches
- *f)* Putty
- *g)* Tread stock
- *h)* Vulcanizing

VALVE-GRINDING COMPOUND — coarse and fine
WASHERS
- *a)* Lock, assorted sizes
- *b)* Wrought iron

WASTE
WIRE — primary and secondary

FOUNDRY WORK

(Continued from page 48A)

molder makes molds on a bench by hand packing and ramming green sand, dry sand, or loam around patterns which have been placed in suitable flasks. He uses riddles, shovels, trowels, slickers, lifters, bellows, and mallets, in the handling, compacting, and smoothing of sand. A machine molder is concerned with the operation of machines that do the actual molding. Machine molding often is made easier by overhead belts which deliver sand to the molder, and conveyers which take the completed molds away from the molding area.

A floor molder makes molds for bulky castings on the foundry floor by packing green sand, dry sand, or loam around patterns which have been placed in suitable flasks. He uses riddles, shovel, rammer, trowel, slick, lifter, bellows, and mallet in handling, compacting, and smoothing sand and directs an electric bridge crane operator in lifting, turning over, and shifting heavy flasks, molds, and patterns.

The pit molder makes molds for large castings in a pit in the foundry floor or makes sections on the floor, and assembles them in the pit. He assembles pattern sections in flasks; fills flasks with sand and compacts it with rammer; withdraws pattern with the assistance of the electric bridge crane operator. The pit molder also patches and repairs damaged mold impressions; assists and directs removal of sections to ovens where they are hardened by baking; assembles baked sections of mold in pit; supervises and assists pouring molten metal into mold; may make segmented sections of mold by the sweep method.

The second basic department is the core making department which produces cores which are used chiefly to form the internal surfaces of castings. Core making consists essentially of packing prepared sand mixtures into boxes or hollow shapes which give desired exterior forms to the cores. Core makers take their names from the type of work or the kind of machine they operate. Thus, there are bench coremakers, floor coremakers, core blowers, operators for jolt-rollover machines, or stock core machines.

A core maker makes sand cores used in molds to form hollows or holes in metal castings; cleans core boxes by blowing out old sand with compressed air; dusts parting sand over inside of core box to facil-

(Continued on page 52A)

Kester Solder

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Electrical-Shop Equipment, Supplies, and Motor Testing Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

BENCH GRINDER
BENCHES — plain or with drawers, for tools and equipment, or with compartments for the storing of wiring panels. Preferably they should have electrical outlets
BITS
- *a*) Auger, ¼ in. to 1 in. by 16ths
- *b*) Auger, 1 1/16 in., 18 in. long
- *c*) Drill, for wood, square shank, ⅛ in. to ½ in. by 16ths
- *d*) Expansion
- *e*) Extension, 18 in.
- *f*) Screw driver, ¼ in.

BLACKBOARD — permanent or portable
BLOWTORCHES — 1-qt. size
BOOKCASE
BRACES — ratchet type, 8-in. swing
BULLETIN BOARD
CABINETS — wood or metal for filing class records, instruction sheets, drawings, etc.
CHAIRS — teacher's and tablet arm
COMPASS SAW
COIL
- *a*) Spreader
- *b*) Taper
- *c*) Winder

DESK — teacher's, with drawer compartments
DRILL
- *a*) Breast
- *b*) Concrete, ⅜ in., ½ in., ¾ in., 1 in.
- *c*) Hand
- *d*) Portable, electric
- *e*) Twist, 1/32 in. to ⅜ in. by 32nds

DRILL PRESS
- *a*) Bench, hand, or power driven
- *b*) Heavy, power driven

FILES
FIRST-AID CABINET AND SUPPLIES
HACK SAW
- *a*) Blades, 10 in., 24 tooth
- *b*) Frames adjustable

HAMMERS
- *a*) Claw, 12 oz.
- *b*) Machinist's, ball peen

HICKEY — ½ in. and ¾ in.
LATHE
- *a*) Engine, 10-in. or 12-in. swing, 6 ft. or 8 ft. long
- *b*) Speed

PLIERS
- *a*) Gas, 6½ in. and 8 in.
- *b*) Side cutting, 6 in.

PUNCH — for metal molding
PUNCHES — assorted
REAMERS
- *a*) Pipe burring, ¼ in. to 1 in.
- *b*) Pipe burring, ½ in. to 2 in.

RULES
- *a*) 48 in. zigzag
- *b*) 72 in. zigzag

SCREW DRIVERS — 3 in., 5 in., and 8 in.
SHEARS — for cutting metal molding
SOLDER DIPPERS
SOLDERING COPPERS
- *a*) Assorted
- *b*) Electric
- *c*) Handles

STOCKS AND DIES — for Pipe threads, ½ in. to 1 in.
VISES
- *a*) Machinist's, 4 in.
- *b*) Pipe

WRENCHES
- *a*) Adjustable, 6 in. and 8 in.
- *b*) Pipe, 10 in., 12 in., and 14 in.
- *c*) Socket, combination

Electrical Shop — Supplies

ABRASIVE CLOTH — Aluminum oxide, 1, 1½, and 2 in. wide
ARMORED CABLE
- *a*) 2 wire, No. 14, single strip
- *b*) 3 wire, No. 14, single strip
- *c*) Box connectors

ATTACHMENT PLUG
BAR HANGERS
BATTERIES — dry cells
BATTERY ACID — 1.300
BATTERY SEALING COMPOUND
BOX CLEATS
BRADS — ¾ in., No. 19, and 1½ in., No. 16
BRAKE LINING — ¼ by 2 in.
BRUSHES — Carbon, for motors and generators
BURGLAR CONTACTS
- *a*) Open circuit
- *b*) Closed circuit

BUSHINGS
- *a*) Loom, No. 1 and No. 2
- *b*) "Jiffy" loom No. 2

BUZZERS
CLEATS — unglazed porcelain, 2 wire
CLIPS — test, with insulators, Universal, Nos. 22, 23, 24, and 25
COMMUTATOR CEMENT
CONDUIT
- *a*) Bushings, ½ in., ¾ in., and 1 in.
- *b*) Box connectors, for flexible
- *c*) Couplings, for flexible
- *d*) Lock nuts, ½ in., ¾ in., and 1 in.
- *e*) Rigid, ½ in., ¾ in., and 1 in.

CONDULET
- *a*) Fillings, ½ in., LL, LR, and LB
- *b*) Covers, ½ in., blank

DOOR OPENERS — mortised
FISH PAPER — .0125 in. thick
FIXTURES — brass chain, suspension
FIXTURE STUDS
FUSES
- *a*) Plug type, renewable, 125 volt, 15 amp.
- *b*) Cartridge type, renewable, 125 volt, 30 amp.
- *c*) Renewals for plug fuses
- *d*) Renewals for cartridge fuses

GROUND CLAMPS — ⅜ in. to 1 in., assorted
HICKEY GRIPS — ½ in. and ¾ in.
LAMPS
- *a*) Carbon, 220 volt, 60 watt
- *b*) Mazda, selected as wattages and voltages
- *c*) Guards for brass sockets

LEATHER NAIL HEADS
LUGS — 25 and 50 amp.
LUMBER — 2 by 4 in. by 14 ft., No. 1, white pine dressed, 4 sides
MOLDING
- *a*) Metal
- *b*) Metal, fittings — crosses, T's, internal elbows, junction boxes, switch bases, keyless receptacles, snap switches

NAILS — roofing
NUTS — iron, 4–36, 6–32, 8–32, 10–24, 12–24, 10–32, 14–20
OUTLET BOXES — 4 in. square, with one round blank cover, and one cover with bushed opening
PIPE STRAPS — galvanized, ⅜ in., ½ in., ¾ in., and 1 in.
PUSH BUTTONS
- *a*) Return call, 3 point
- *b*) Single

RECEPTACLES
- *a*) Flush, duplex
- *b*) Porcelain cleat, 660 watt, 250 volt
- *c*) Concealed
- *d*) Covers

RECTIFIERS — Tungar, for charging from 1 to 12, 6- and 12-volt batteries
RELAYS — Dixie
RESISTANCE BOARDS — for testing
RESISTANCE UNITS — 125-ohm
RHEOSTATS
- *a*) Compression, 275 watt
- *b*) Field, for shunt and compound motors

ROSETTES — wood
ROTARY CONVERTER — 5-kw. capacity, 3 phase a.c., 110 volt d.c.
SCREWS
- *a*) Anchors, 8/32, 10/24, 12/24, 14/20
- *b*) Machine, roundhead, 4–40 by ¼ in., 6–32 by ½ in., 6–32 by ¾ in., 8–32 by ⅜ in., 8–32 by ½ in., 8–32 by 1 in., 10–32 by ⅜ in., 10–24 by ⅜ in., 10–24 by ¾ in., 10–32 by ¾ in., 12–24 by 1 in.
- *c*) Machine, brass, roundhead, 4–40 by ¼ in., 6–32 by ½ in., 6–32 by ¾ in., 8–32 by ½ in.
- *d*) Wood, flathead bright, No. 5 by ¾ in., No. 8 by ½ in., No. 8 by ¾ in., No. 8 by 1 in., No. 7 by 1½ in., No. 8 by 1½ in., No. 7 by 2 in.
- *e*) Wood, roundhead blued, No. 7 by 1 in., No. 8 by 1½ in., No. 10 by 1½ in., No. 7 by 2 in.

SLEEVING — No. 1, white; No. 1, blue; and No. 1, red
SOCKETS
- *a*) Brushed, brass pull chain, keyless, key
- *b*) Porcelain, keyless, with caps
- *c*) Porcelain, key, with caps

SOCKET CAPS — ¼ in. and ⅜ in. bushed
SOLDER WIRE — 50/50, size No. 10
SOLDERING PASTE — 2 oz. cans, noncorrosive
SOLDERING SALTS — 1-oz. cans, noncorrosive
SPEED COUNTERS — 0–9999
SPLIT KNOBS — porcelain
SPRING BALANCES — 0–30 lb.
STARTING BOXES
- *a*) For compound motors, various makes
- *b*) For shunt wound, 1 h.p., 110-volt motors. Overload release
- *c*) For shunt wound, 1 h.p., 110-volt motors. No voltage release
- *d*) Starting devices of various makes and principles, for 1 h.p., 3-phase, 220-volt a.c. motors

STORAGE BATTERIES — 6 volt
SWITCH
- *a*) Battery, 4 point
- *b*) Bases, porcelain, for 10-amp. switches

(Continued on page 54A)

FOUNDRY WORK

(Continued from page 51A)

itate removal of finished core; packs and rams core sand solidly into core box, using shovel, hands, and tamping tools; sets vent wires and reinforcing wires as sand rises in box; lifts box from core, leaving core on plate for handling and drying; repairs breaks in core with spoon; sends core to baking oven to harden for use in foundry molds.

A bench core maker is one who makes small and medium sized cores, used in molds to form hollows and holes in metal castings, on a workbench while a floor core maker is one who makes large cores, used in molds to form hollows and holes in metal castings, on the foundry floor.

A machine coremaker fashions sand cores, used in molds to produce hollows or holes in castings, using a turn-over-draw machine to compact the sand and facilitate the removal of the finished cores

(Continued on page 56A)

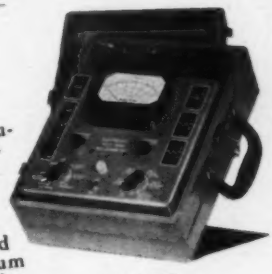
Dependable...Rugged INSTRUMENTS

for electrical and electronic instruction

Standardize on WESTON instruments throughout your electrical courses, and thus be sure your students are thoroughly familiar with the instruments they will use all through their working careers. Accurate, economical, rugged and dependable—types available for all laboratory and classroom needs. Literature on request. WESTON Electrical Instrument Corporation, 601 Frelinghuysen Avenue, Newark 5, New Jersey.

ELECTRONIC ANALYZER

Three-in-one instrument. Provides self-contained Volt-Ohm-Milliammeter, high impedance electronic Volt-Ohmmeter, and probe type Vacuum Tube Voltmeter for use to 300 megacycles.



Model 769

Model 280

D-C MINIATURE INSTRUMENTS

Single and multi-range voltmeters, ammeters, voltammeters available. Accuracy within 1%. Hand calibrated scales. Knife-edge pointers, mirrored scales eliminate parallax errors.

SUPER-SENSITIVE ANALYZER

Volt-Ohm Milliammeter, 26 ranges, temperature compensated, D-C voltage ranges have either 1000 or 20,000 Ohms per volt sensitivity. Precision resistors used throughout. Solid oak carrying case. Small, light, compact.

Model 779

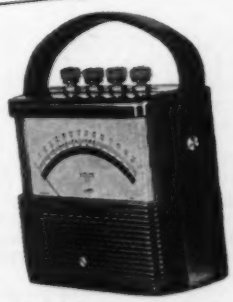
Model 697

VOLT-OHM-MILLIAMMETERS A-C D-C

Carefully selected group of ranges for A-C, D-C voltage measurements, direct current and resistance values. 1000 Ohms per volt sensitivity. Self-contained battery . . . equipped with test leads.

D-C PORTABLE INSTRUMENTS

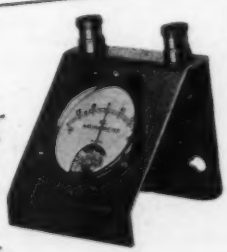
Highly shielded single and multi-range voltmeters, ammeters, milliammeters and microammeters. Temperature compensated . . . hand calibrated mirror scales. Accuracy within ½ of 1%.



Model 931

STUDENT GALVANOMETER

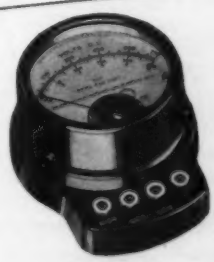
Available with or without base. Widely used in school instruction where dependability and low cost are paramount. Sensitivity: 22 microamperes. Resistance: 23 Ohms. Scale: 30-0-30. Medium and extreme sensitivity models also available.



Model 375

D-C MINIATURE PORTABLE INSTRUMENTS

Rugged, serviceable for all-around use. Available in single, double, and triple ranges for voltage measurements; single and double ranges for current measurements. Accuracy 2%.



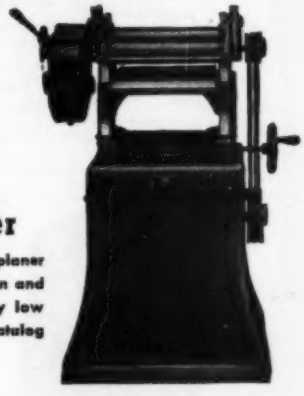
Model 489

WESTON INSTRUMENTS

The Sensationally NEW Low-Priced

PARKS No. 20
20" PLANER

Here is a modernly designed, rugged, high-speed, low-priced planer that is ideally suited for every shop and industrial plant requiring a quality surfacer. The Parks No. 20 Planer has a four-knife cutterhead with a speed of 3600 R.P.M. and offers two feed speeds — 20 and 40 F.P.M., and 40 and 80 F.P.M. Write for complete descriptive literature.



The PARKS Heavy-Duty 12" x 4" Planer

A compact, sturdy, thickness planer that offers mill planer precision and ruggedness at a sensationally low price. Write for descriptive catalog sheet.

The PARKS WOODWORKING MACHINE CO., Dept. 22 A3 1546 Knowlton St., Cincinnati 23, O.

(Continued from page 52A)

c) Boxes, 2¾ in. deep
d) Entrance, safety, 2 pole, 30 amp., with 2-branch lighting circuits
e) Entrance, safety, 3 pole, 30 amp., 250 volt
f) Flush, push button, S.P., D.P., 3 way, 4 way
g) Surface, S1, S3, and S4
h) Knife, type A, D.P.S.T., D.P.D.T., S.P.S.T., and S.P.D.T.
i) Surface, snap, electrolier
k) Surface, snap, S.P.D.P., 3 way, 4 way

SWITCHBOARD — as required

TACKS — double-pointed No. 10

TAPE
a) Friction, ½-lb. rolls
b) Rubber, ½-lb. rolls

TELEGRAPH SETS — including sounders, keys, and relays

TELEPHONES
a) Complete bridging, independent phones
b) Couch vestibule telephones
c) Receivers, transmitters, induction coils, condensers, and bridging switch hooks

TRANSFORMERS
a) Bell ringing, 6, 8, 14 volt
b) Single phase, 110–220 volt, S.K.V.A.

TUBES — porcelain, 5/16 by 3 in., 5/16 by 5 in., and 5/16 by 10 in.

TUBING — flexible nonmetallic, ¼ in. and ⅜ in.

WASHERS
a) Iron, ¼ in. and ⅜ in.
b) Brass, ¼ in. and ⅜ in.

WIRE
a) Annunciator No. 18 or No. 20
b) Fixture, No. 18, single yellow, with marker
c) Rubber covered, solid copper, No. 10, black
d) No. 10, white
e) No. 14, black
f) No. 14, white
g) Rubber covered, No. 16, brewery cord
h) No. 18, lamp cord, green and yellow
j) S.C.C. copper magnet, enameled, sizes Nos. 16 to 26 inclusive

Electrical Shop — Motor and Testing Equipment

ANNUNCIATORS
a) Automatic needle drop
b) Gravity drop
c) Manual needle drop

ARMATURES — burnt out, for repairing

BATTERY CHARGER — commercial

CIRCUIT BREAKERS
a) Air, single pole, overload, 25 amp., 550 volt
b) Air, single pole, underload, 15 amp., 550 volt

CONTROLLERS
a) For multiple-speed motor
b) For 1 h.p., 110-volt series motors

GENERATORS
a) Motor-generator set, 10 h.p., to supply 110-volt d.c. for testing purposes, battery charging, etc.
b) Generator, 6-volt d.c. coupled to an a.c. motor for 6-volt circuit testing
c) Auto generators of different makes

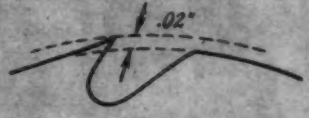
GRAVITY CELLS

MAGNETS — testing, 10,000 ohm

METERS
a) Ammeter, standard, 60 amp., a.c.
b) Ammeter, standard, 60 amp., d.c.
c) Ammeter, student, 60 amp., a.c.
d) Ammeter, student, 60 amp., d.c.
e) Voltmeter, standard, 0–10 volt, d.c.–a.c.
f) Voltmeter, standard, 110–220
g) Voltmeter, standard, 125 volt
h) Voltmeter, standard, 125 volt, d.c.
j) Voltmeter, student, 110 volt, d.c.
k) Voltmeter, student, 110 volt, a.c.
l) Wattmeter, standard, 110–220 volt, 30–60 amp., d.c.–a.c.
m) Wattmeter, student, 110–220 volt, 30 amp., a.c.–d.c.
n) Watt-hour meter, 125 volt, 5 amp., a.c., single phase, various makes

MOTORS
a) Auto starter, different makes
b) Burnt out, fractional h.p., 110 volt, 60 cycle, for repairing
c) Compound, 1 h.p., 110 volt, d.c.
d) Multiple speed, 1 h.p., 3 phase, 220 volt
e) Series, 1 h.p., 110 volt, d.c.
f) Shunt, 1 h.p., 110 volt, d.c.
g) Split phase and repulsive, a.c., 110 volt, single phase, assorted
h) Split phase induction motors, fractional h.p., 110 volt, 60 cycle, different makes
j) 3 phase, 1 h.p., a.c., 220 volt, various makes
k) 3 phase, 2 h.p., 220 volt, a.c., various makes
l) Universal, fractional h.p., 110 volt, different makes
m) Universal, variable speed, ⅓ h.p.

PLATFORM SCALE — 100 lb. capacity



WHAT THE PTI CUT CONTROL BLADE IS:

Each PTI Saw Blade has only 8 teeth instead of the customary 100. These teeth are entirely different from the conventional saw tooth — they project only 20/1000" above the non-cutting edge. Thus the cut of each tooth is "controlled" by the non-cutting edge, in contrast to the ordinary saw blade where each tooth cuts right down to its base. This relatively simple alteration in design actually works miracles in the performance of the saw blade.

PTI

PATENT PENDING

CUT CONTROL

TESTED AND APPROVED

The PTI Cut Control Saw Blade is the first and original blade of this type. It was developed by one of the world's foremost saw manufacturers—and then thoroughly tested in the leading shops and laboratories of Europe and America for more than two years. It is the first saw blade of this kind tested by the Forest Products Laboratories, Madison, Wis., Timber Engineering Company, Washington, D.C., the University of Zurich, Switzerland, and other testing laboratories with favorable reports issued in every instance.

Actual letters from delighted users in America and Europe crowd our files.

Gamble Brothers of Louisville, Kentucky, report.

"We have completed the first phase of the test run on the "Cut-Control" 8-Tooth Carboloy Tipped Rip Saw. This saw was installed in February of this year on a G. M. Diehl Chain Feed Rip Saw and has had a total of 2,037 operating hours, having run on both the day and night shifts. Three hundred and four thousand net feet of dimension lumber was passed over this blade, almost entirely in two species of lumber, oak and hard maple. The thicknesses ranged from 4/4 to 6/4. This saw was only removed from the arbor for washing and occasional hand honing of the carboloy tips. During its entire operation the saw has produced a quality cut suitable for edge gluing."

New PTI SAFETY SAW BLADE

Takes the DANGER out of circular sawing!

SAVES POWER • CUTS SMOOTHER • LASTS LONGER

Here is the greatest improvement in circular sawing — since the invention of the circular saw. The sensational new PTI Cut Control Saw Blade that brings long-needed safety and remarkable new efficiency to this important tool! Now—for the first time your shop can have a circular new safeguard *in addition* to the regular blade guards, splitters and anti-kickback holders—a safeguard that protects operators even if the conventional devices are inadvertently or carelessly removed. Never before has a saw blade been subjected to such gruelling, thorough tests, to such careful checking and rechecking by leading laboratories, government agencies, universities, and industrial concerns. And never before has a saw blade made such astounding records in safety and cutting efficiency.

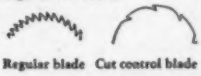
1 Complete Safety From "Kickbacks" — Since the teeth are only 20/1000" high — they cannot grab the wood and throw it against the operator — eliminating one of the most serious causes of circular saw injuries.

2 Reduced Direct Injuries — Cut Control teeth do not drag the hand into the saw. The non-cutting edge acts as an effective stop to cuts and limits their depth.

3 Cuts Chips — Not Sawdust — Unique cutting action produces chips. Easier to clean. Eliminates fire hazard of spontaneous combustion.

4 30% to 40% Power Saving — Fewer teeth mean fewer cuts to achieve same results — hence less power consumption.

5 Longer Life Without Sharpening — When cutting off chips — the wedge action of the tooth does most of the work — which means less wear on the cutting edge of the teeth.



Regular blade Cut control blade

6 More Efficient Cutting — Each tooth is backed up better against body of blade. It is therefore more rigid, less likely to vibrate — and cuts more smoothly.

7 Quieter Running — Fewer teeth makes saw practically noiseless when running true.

8 Blade Does Not Crack — Blades are made of special Vanadium Steel. In addition — controlling of cut prevents overloading of teeth, a common cause of blade cracking.

ORDER TODAY SATISFACTION GUARANTEED!

See your dealer today. Ask for a demonstration. If he cannot supply you — you can order direct. Prices are for special Vanadium Steel blades, combination rip and cross cut, delivered, postpaid.

7" dia. blade $4.95	12" dia. blade $ 9.40
8" dia. blade $5.90	14" dia. blade $11.40
10" dia. blade $7.50	16" dia. blade $14.00

(Prices on carbide tipped blades furnished on request.)

PTI

INCORPORATED Dept. IA3
401 Broadway, New York 13, New York

Gentlemen: Rush me the following units:

Quantity	Blade Number	Blade Bore

Please check: .....Money order or check for $..... .....Send C.O.D.

Name.....

Address.....

City.....City.....Zone..State.....

Canadian Distributor: The Preston Woodworking Machinery Co., Ltd., Preston, Ont., Can.

Woodworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

BENCH
- *a*) Shop, with hardwood tops, 1¾ in. or over in thickness, the top to project far enough to allow a rapid-acting or continuous-screw vise to be attached.
  It may be well to order a 1-in. birch or maple board wide enough to cover the working face of the bench at the time of buying the benches. This board can then be fastened to the top proper with screws and may be conveniently replaced when worn. The benches should be made of thoroughly kiln-dried lumber throughout. They may be either plain or of 6-drawer type
- *b*) Glue
- *c*) Stain, with metal-covered top
- *d*) Teacher's demonstration

BLACKBOARD — permanent or portable

BOOKCASE

BULLETIN BOARD

CABINETS — wood or metal for filing class records, instruction sheets, drawings, finishing materials, hardware, small tools, supplies, etc.

CHAIRS — teacher's and tablet arm

CORE OVEN — for patternmaking class

DESK — teacher's, with drawer compartments

FURNACE — for melting soft metals (for patternmaking class)

GLUEPOT — 1 qt. or 2 qt., electric, gas, or steam heat

GLUE WARMER OR COOKER — 1- to 5-gal. capacity

GRINDER
- *a*) Automatic knife, direct-motor-type. Size to suit largest knife used in school shop, complete with water pump, grinding wheel, and automatic stops
- *b*) Bench, hand or power
- *c*) Bench, motor-in-head. Motor bearings to be completely housed, wheels to be equipped with safety flanges and carefully guarded throughout. One fine-grit, and one coarse-grit wheel
- *d*) Revolving oilstone, pedestal type, with one fine and one coarse oilstone

JOINTER
- *a*) 6-in. or 8-in. portable jointer. Table to be fitted for rabbeting. Safety-cylinder type, equipped with safety guard.
- *b*) 12, 16, or 18 in. direct motor drive, ball bearing. Cylinder to be of safety-head type. Table to be fitted for rabbeting. Jointer to be equipped with safety guard.

LATHES
- *a*) 6-in. to 16-in. motor-in-head, motor-in-base, or belt-driven speed lathe, to take 24, 36, 48, 60, or 72 in. between centers. Each to be complete with cup center, spur center, faceplate, rosette chuck, tool rests, and center drift for head block.
- *b*) Patternmakers', with end faceplate provision. Lathe to be of direct-motor-drive type, equipped with variable speed motor, faceplates and floor stand. (For patternmaking class)

MORTISER
- *a*) Direct-motor-drive, or belt-driven, hollow-chisel mortiser, foot feed. Table to be of the tilting type with hold-down clamps and stop rod.
- *b*) Portable, vertical, hollow-chisel mortiser, bench type

PLANER — 12, 18, 20, 24, or 30-in., motor or belt driven, single-surface planer. Safety-head cylinder, three-knife type, fitted with good-grade steel knives. Knife-setting and jointing device complete with bar should be mounted on machine if possible.

SANDER
- *a*) Belt, direct motor drive
- *b*) Disk, motor or belt driven
- *c*) Oscillating spindle, motor driven
- *d*) Portable, hand-plane type, direct motor drive
- *e*) Vertical spindle and disk sander

SAWS
- *a*) Band saw, 20 to 36 in., motor drive. Upper and lower wheels to be completely guarded. Table to tilt to 45 deg.
- *b*) Combination, band saw, crosscut saw, ripsaw, and mortiser. Machine to be completely guarded.
- *c*) Cutoff, pedestal or swing type to be fitted with 12-in. to 16-in. saw
- *d*) Filing machine, direct motor drive
- *e*) Jig, direct motor or belt driven
- *f*) Portable band saw, 14 to 20 in. ball bearing, motor driven
- *g*) Saw bench, directly connected to motor, and to have both rip and crosscut saws. Rip and crosscut gauges also to be provided
- *h*) Universal saw bench, 14 to 16 in., motor driven
- *j*) Variety saw bench, motor driven, tilting table, with universal sliding table. The arbor is to be fitted for a dado head, and the table is to be slotted accordingly. The saw is to be equipped with ripping fence and miter cutoff gauges

SHAPER
- *a*) Motor drive, single or double spindle. Table to be equipped with removable center plate.
- *b*) Portable shaper or router with a suitable selection of cutters

TENONER — single end, with coping heads and cutoff saw

VISES — rapid-acting or solid-nut type woodworking-bench vises, 7 to 10 in.

WOOD TRIMMERS — complete with all gauges and taper pins. Base of trimmer to be slotted and laid out for degree settings (for patternmaking class.

Woodworking — Small Tools

AWLS — brad, assorted sizes

BEVELS
- *a*) Protractor
- *b*) Sliding T, 8 in.

BITS
- *a*) Auger, 3/16 in. to 1 in., inclusive, by 16ths
- *b*) Auger, 3/16 in. to ½ in. inclusive, by 16ths
- *c*) Braces, ratchet type, 8-, 10-, 12-, or 14-in. sweep
- *d*) Countersink, for wood, rose pattern, ½ in. and ⅝ in.
- *e*) Dowel, square shank, ¼ in., 5/16 in., ⅜ in., ½ in., ¾ in.
- *f*) Expansive, ⅞ in. to 1½ in.
- *g*) Expansive, ⅞ in. to 3 in.
- *h*) Forstner, square shank, ¼ in. to ½ in. inclusive, by 16ths
- *j*) Screw driver square shank, ¼ in., 5/16 in., ⅜ in.
- *k*) Twist drill for wood, square shank, 1/16 in. to ⅜ in. inclusive, by 16ths
- *l*) Twist drill, straight shank, 1/16 in. to ⅜ in., inclusive, by 32nds

BLOWTORCH

BROOMS

BRUSHES
- *a*) Bench duster, 10 in.
- *b*) Floor
- *c*) Glue, round, 1½ in. and ¾ in.
- *d*) Glue, round, 1½ in.
- *e*) Marking, camel's hair, No. 1 and No. 2
- *f*) Varnish, flowing, 2 in. and 2½ in.
- *g*) Varnish, flat, ½ in., ¾ in., and 1 in.

BURNISHERS — oval or round

CAN OPENER

CARVING TOOLS
- *a*) Sets containing 6 tools
- *b*) Sets containing 12 tools

CHISELS
- *a*) Cold, machinists', ⅜ in. and ½ in.
- *b*) Mortising chisel and bits, ¼ in. to 5/8 in. by 16ths
- *c*) Socket firmer, bevel edge, ⅛ in., ¼ in., ½ in., ¾ in., 1 in., and 1½ in.
- *d*) Socket firmer, plain edge, ½ in., ¾ in., and 1 in.
- *e*) Tanged firmer, bevel edge, ⅛, ¼, ½, ¾, 1, and 1¼ in.

CLAMPS
- *a*) Bar, 24, 36, 48, and 60 in.
- *b*) Hand-screw, 4, 5, 6, 7, 8, 10, 12, and 14 in.

(Continued on page 58A)

FOUNDRY WORK

(Continued from page 52A)

from the boxes in which they are made; clamps core box on machine table and fills it with sand; opens compressed air valve, causing the table to rise and fall repeatedly so that the sand is compressed in the box. He embeds reinforcing wires in the sand, shovels additional sand into the box, and repeats jolting; moves levers or turns handles, causing table to roll over and deposit core box upside down on another table; opens valve to jolt box and loosens core; pushes table down, causing core to be stripped from box; smooths core and places it on plate to be removed to core oven for baking.

A core blower makes cores in a core blowing machine. He places core box in machine and pulls lever or depresses pedal, causing machine to blow and compact sand in core box; removes box, removes core, and places it on a plate for removal to oven for baking.

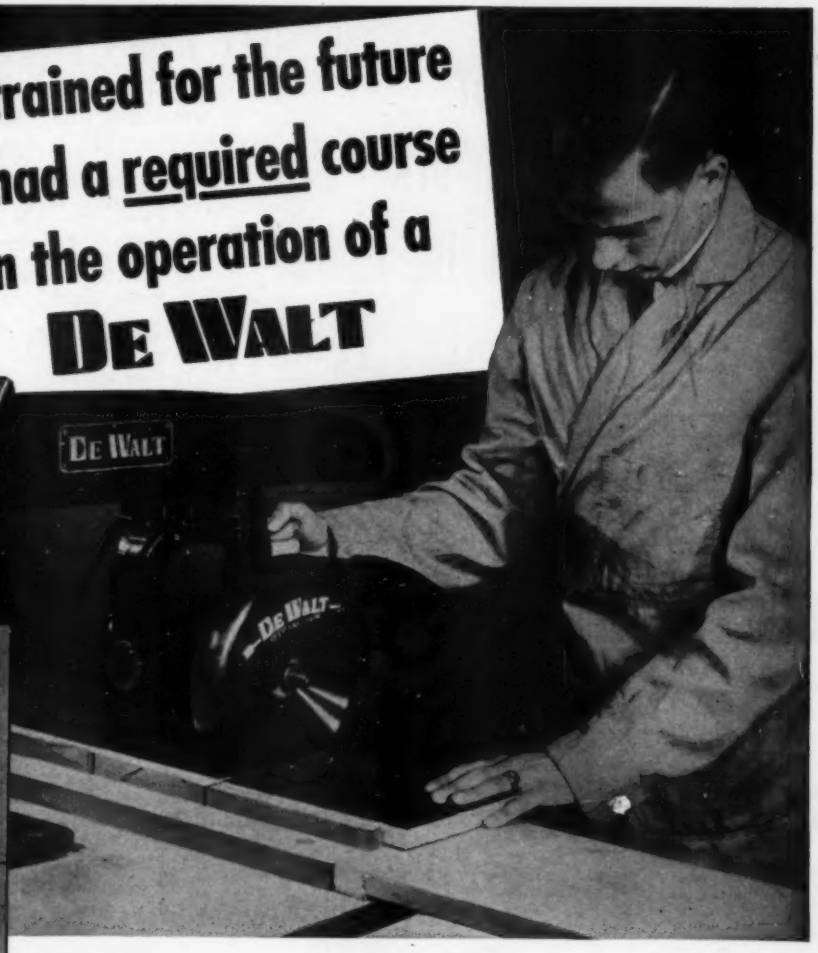
The third department is the melting department which is responsible for supplying molten metal of the type and the amount required and at the time it is needed. Workers in this department are named for the tasks they perform. Among the tasks performed are lining and repairing furnaces and ladles with refractory brick and patching materials.

The title, melter, is used as a general term for workers who melt metal. They are usually specifically designated according to the type of furnace used, as cupola tender, electric-arc-furnace operator, reverberatory furnace operator, and tilting furnace operator.

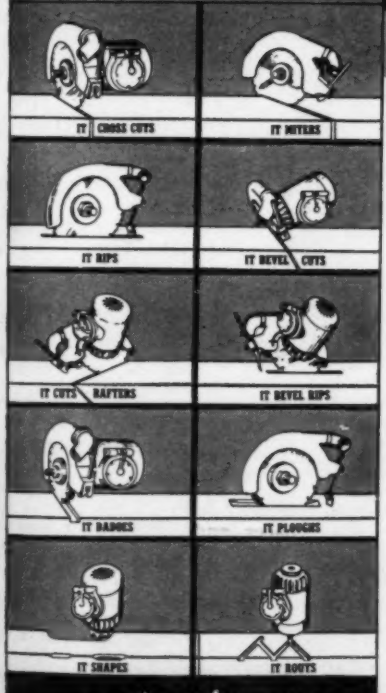
The finishing department is where the

(Continued on page 62A)

He's really trained for the future when he's had a required course in the operation of a DE WALT



DE WALT is a complete shop in itself



...and with proper tools makes any cut possible!

After the student has completed his basic training course in the use of hand tools, he should have a required course in the operation of De Walt.

Knowing how to make the fullest use of this flexible, easy-to-operate machine, will give any student a head-start as he prepares for tomorrow's industry.

When he leaves school he will be fully acquainted with a machine that is destined to occupy a prominent place in tomorrow's industry. The perfection of the De Walt saw has created new methods in cutting wood, making obsolete old-style equipment previously used.

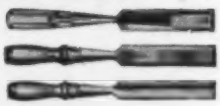
Ask a nearby De Walt dealer about two De Walt 16MM movies—one showing the general application of De Walt — the other showing modern, pre-cutting techniques developed during the war. Write for catalog.

DE WALT, INC.

73 Fountain Avenue Lancaster, Penna.

CHISELS, GOUGES, TURNING TOOLS

Tough, lasting fine cutting edges for all types of woodworking. Various types of socket butt and firmer chisels with "Hardwear" green plastic or hickory handles. Outside or inside bevel socket gouges. Short and full length turning tools.



AUGER BITS, CAR BITS AND DRILLS

There's a GREENLEE for every need . . . all types of twists and heads. Accurately sized, perfect cutting edges. Line includes the famous "Greenlee 22" Solid-Center Auger Bits which come to you "Plastic Sealed" for factory-sharp edges.

EXPANSIVE BITS

Fast, easy-boring Expansive Bits with free, positive chip clearance. Specially-designed wide, open throat assures smooth, uninterrupted action. In two styles — Setfast with quick adjusting-locking feature and Plain.

SPIRAL SCREWDRIVERS AND AUTOMATIC PUSH DRILLS

GREENLEE Spiral Screw Drivers are sturdily constructed and have special phosphor bronze drive nuts for long, hard service. Beautifully finished, three sizes. Automatic Push Drills have completely enclosed working parts and phosphor bronze drive nuts. Handle holds eight points. Chromium plated.

The GREENLEE line also includes Bit Extensions, Razor-Blade Draw Knives, Ship Augers, Electricians' Bits, Hand Benders for Tubing, Radio Chassis Punches, Knockout Tools and many other timesaving tools for the shop worker and the student.

TOOLS FOR CRAFTSMEN
GREENLEE

Free Folder H-301 with complete data on GREENLEE hand tools for the woodworker. Write Greenlee Tool Co., Division of Greenlee Bros. & Co. 2023 Twelfth Street, Rockford, Illinois. U. S. A.

(Continued from page 56A)

c) Malleable-iron C, 4, 6, and 8 in.

DIVIDERS — wing, 6 in. and 10 in.

DOWEL PLATE — 6 in. long.

DOWELING JIGS — with bushings

DRAWKNIVES — 7 in.

DRILL
- a) Automatic hand, with 8 drill points
- b) Chuck, 0 to 3/8 in.
- c) Hand, 0 to 3/8 in., for round-shank drills
- d) Star, for concrete, 1/2 in. and 3/4 in.

FILES
- a) Auger bit, assorted, 6 in.
- b) Cabinet, 8 in. and 10 in.
- c) Card and brush
- d) Flat, wood, 10 in.
- e) Mill, bastard cut, 12 in.
- f) Round, bastard cut, 12 in.
- g) Taper, slim, 5 1/2 in. and 7 in.

FIRST-AID CABINET AND SUPPLIES

GAUGES
- a) Bit, adjustable
- b) Jointer
- c) Marking, metal or hardwood
- d) Mortise, metal or hardwood
- e) Panel

GLASS CUTTER

GOUGES
- a) Tanged firmer, outside ground, handled, 1/8, 1/4, 1/2, 3/4, and 1 in.
- b) Tanged firmer, inside ground, handled, 1/8, 1/4, 1/2, 3/4, and 1 in.
- c) Spoon, 1/2, 3/4, and 1 in.

HAMMERS — claw, bell faced, 10, 12, 13, and 16-oz.

HATCHET — bench, 4-in. cut.

JARS — earthenware, 1-qt. capacity

KNIVES
- a) Jointer, to fit power machine
- b) Planer, to fit power machine
- c) Sloyd, 3-in. blade

LEVELS
- a) Wood, 24 in.
- b) Machinists', 12 in.

MALLETS — hickory, 3 by 5 in. head

NAIL SETS — 1/16 in. and 3/32 in. points

OILERS — bench, 1/3 pt., coppered, best grade

OILSTONES
- a) 1 by 2 by 8 in. in iron box
- b) Gouge slip, medium, 4 1/2 by 2 1/4 by 5/8 by 5/16 in.
- c) Gouge slip, fine, 3 by 2 by 3/8 by 1/8 in.

PINCERS — 6 in. carpenters'

PINCH DOGS — 3/4, 1, and 1 1/4 in.

PLANES
- a) Block, adjustable, 6 in. long, 1 5/8-in. cutter
- b) Circular
- c) Combination, adjustable
- d) Core box
- e) Duplex, fillister and rabbet
- f) Fore, 1/8 in., 2 3/8-in. cutter
- g) Irons, double
- h) Jack, 14 in., 2-in. cutter
- i) Jointer, 24 in.
- k) Round, wood, 1 3/4 in.
- l) Router
- m) Smooth, 9 in., 1 3/4-in. or 2-in. cutter

PLIERS
- a) Roundnose, 5 in.
- b) Side-cutting, 6 in.

PUTTY KNIVES

RASPS — half round, wood, 10 in.

RULES
- a) Board
- b) 1 ft. or 2 ft. graduated by 8ths and 16ths
- c) Shrink, 1/8 in., 3/16 in.

SAWS
- a) Back, 12 in., 14 point
- b) Band, to fit power machine
- c) Compass, 10 in.
- d) Coping, frames
- e) Coping, blades
- f) Crosscut, 9 tooth, 22 in. long
- g) Crosscut, circular for power machine
- h) Dado, 1/8 in. to 1 1/16 in. to fit power-saw arbor
- j) Hack, frames, 10 in. or adjustable
- k) Hack, blades, 10 in.
- l) Keyhole, 10 in., 10 point
- m) Rip, 7 point, 22 in. long
- n) Rip, circular for power machine
- o) Set, 10 points per inch and finer
- p) Set, 10 points per inch and coarser
- q) Turning frame, 14 in.
- r) Turning blades, 5/16 by 12 in., 10 tooth
- s) Miter box, 24 by 4 in. saw, 7 in. capacity at miter

SCRAPERS
- a) Cabinet
- b) Glue, triangular
- c) Veneer, blade, 2 3/4 in. long, handle 11 in. long

SCREW DRIVERS
- a) Cabinetmakers', 4, 6, and 8 in.
- b) Quick return, spiral ratchet

SHOOT BOARD — and plane

SNIPS — tinners', forged steel, 2 1/2-in. cut

SPOKESHAVES — adjustable, raised handle, 10 in. long

SQUARES
- a) Combination, 12 in.
- b) Try, iron handle, 8 in.
- c) Framing, 2 ft.

STEEL FIGURES — hand cut, 1/4 in.

TAPELINE — 50 ft., steel

TRAMMEL POINTS — adjustable metal frame, steel points

TURNING TOOLS
- a) Calipers, 6 in. inside and outside
- b) Calipers, 12 in. inside and outside
- c) Parting tools, 1/8 in.
- d) Round point, 1/4 in., 1/2 in., 1/4 in.
- e) Spear point, 1/4 in., 1/2 in., 1/4 in.
- f) Square point, 1/4 in., 1/2 in., 1/4 in.
- g) Turning chisels, 1/4 in., 1/2 in., 1/4 in.
- h) Turning gouges, 1/4 in., 1/2 in., 1/4 in.
- j) Turning skews, L.H., 1/4 in., 1/2 in., 1/4 in.
- k) Turning skews, R.H., 1/4 in., 1/2 in.

VISE — 3-in. jaw, anvil face

WRENCHES
- a) Adjustable, 8, 10, and 12 in.
- b) Headless setscrew
- c) Pipe, 10 in. and 12 in.
- d) S type or open-end type to fit 1/8-in. to 1-in. N.C. nuts

(Continued on page 60A)

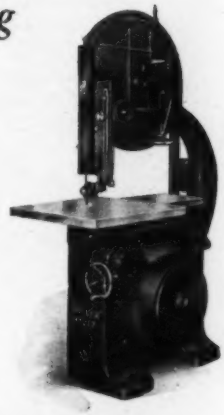
"OLIVER" WOODWORKING MACHINERY

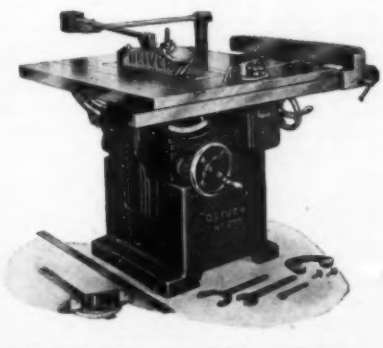
Over 2200 vocational shops use "Oliver" machines to give their students the best training

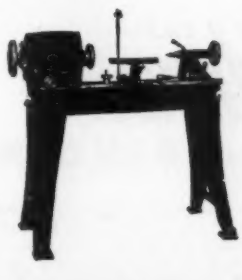
TRAIN your students *right!* When trained on "Oliver" equipment, they enter industry with a sound training as a basis for further progress. In over 2200 vocational shops instructors *know* that "Oliver" machines give more for the dollar in performance. They *know* these machines are able to *"take it"* year after year without flinching.

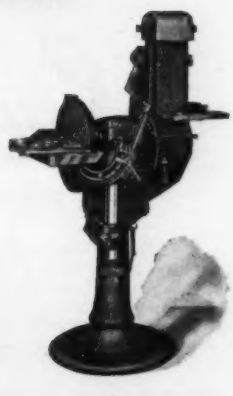
"Oliver" machines are designed and built for industry by engineers who are also acquainted with the needs for thorough student training. They're easy to operate, and have the latest safety features. Students soon learn to set up an "Oliver" accurately. Self-locking devices keep machines in perfect adjustment.

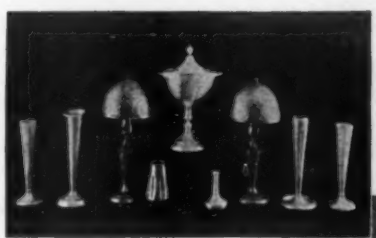
The machines shown here are but a few of a complete line to make your efforts most effective.











METAL SPINNING LATHE *— helpful and valuable in any shop!*

You can spin beautiful as well as useful vases, cups, trays, etc., from pewter, copper, bronze and other sheet metals. The "Oliver" No. 159-M Metal Spinning Lathe is precision-built with extra heavy bearings to withstand severe service. Has ball bearing variable-speed motor-driven headstock and live tail center. Swings 12" diameter, 24" between centers. Lathe can also be used for turning wood and soft metals.

"OLIVER" EQUIPMENT FOR VOCATIONAL SHOPS

Circular Saw Benches	Surface Planers	Sanders
Cut-off Saws	Boring Machines	Shapers
Metal Spinning Lathes	Mortisers	Tenoner
Wood Turning Lathes	Wood Trimmers	Oilstone Tool Grinder
Band Saws	Jointers	Knives and Saws
Band Saw Brazer	Jig Saw	Electric Glue Heater

Over 2200 vocational shops use "Oliver" equipment. Tell us the machines that interest you, and we'll send you illustrated bulletins containing full details.

OLIVER MACHINERY COMPANY
Established 1890
GRAND RAPIDS 2, MICHIGAN

SHOP QUIZ for Vocational Instructors

Which Balanced Sander . . .

- - - sands *with, across* and *against* the grain?
- - - sands *flat, concave* and *convex* surfaces?
- - - produces a more *uniform* and *finer* finish on wood, plyboard, composition, plastic, metal, plaster, leather and blackboards?
- - - easiest to use by student, instructor, and maintenance worker?

Answer...

ORBITAL MOTION—All grits move in a 3/16" dia. orbit at 12,000 cycles per min. — assuring glass-smooth sanding.

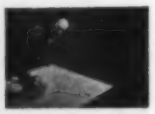
PORTER CABLE **Speedmatic** STERLING 1000 SANDER

This orbital-motion Speedmatic-Sterling will not scratch, gouge or leave a pattern. Light (weighs only 8 lbs.), vibrationless, *balanced* for easy one-hand operation — anyone can use it. Takes one-third of standard 9" x 11" abrasive sheet — sanding pad snaps on and off in a jiffy. Also available in complete kit containing additional pads, filters, lubricants, etc. *Send coupon for complete details.*

Gives perfect surface—regardless of direction of grain.

Does coarse and finish sanding; rubbing and polishing.

Sands rounded surfaces. Unmatched for feather-edging.



Ideal for rubbing varnish, lacquer; removing stains, blemishes.

PORTER-CABLE MACHINE CO.
4023 N. SALINA STREET, SYRACUSE 8, N. Y.

Please send me full information on the Speedmatic-Sterling 1000 Sander — also name and address of my nearest dealer.

Name.....

Address.....

City.....Zone.....State.....

Manufacturers of SPEEDMATIC and GUILD Electric Tools
In Canada write Strongridge Ltd. St Catharines Ont

(Continued from page 58A)

Woodworking — Materials and Supplies

ALCOHOL

BENZINE

BRADS — 3/8 in., 1/2 in., and 5/8 in. No. 20; 3/4 in. and 7/8 in. No. 19; 1 in. No. 18; 1 1/4 in. and 1 1/2 in. No. 16; 1 3/4 in. No. 15; 2-in. and 2 1/2 in. No. 14

CARBON PAPER — black

COLORS — dry: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, Vandyke brown, and vermilion

COLORS — ground, in oil or japan: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, rose lake, Vandyke brown, and vermilion

DECALCOMANIA TRANSFERS

DOWEL PINS AND PLATES

DOWELS: hardwood, 3-ft. lengths, 1/4 in., 5/16 in., 3/8 in., 1/2 in., 3/4 in.

ENAMEL
- *a*) Selected colors
- *b*) Undercoater

FILLERS — paste: natural, golden oak, dark oak, and mahogany

FILLETS — leather, 1/4 in. and 1/2 in.

GLUE
- *a*) Casein, hide, best grade cabinet
- *b*) Liquid

HARDWARE: Brackets, buttons, butts, casters, catches, chain, chest corners, chest trimmings, corner braces, corner irons, corner plates, desk fittings, door fittings, escutcheons, fasteners, handles, hangers, hinges, hasps, holders, hooks, knobs, latches, lamp fittings, lid supports, locks, pulls, smoking-stand outfits, springs, stops, supports

HOOKS
- *a*) And eyes
- *b*) Cup
- *c*) Screw and
- *d*) Square screw

LACQUER — black, clear, cobalt blue, ivory, medium green, red, thinner, white, and yellow

LUMBER — Ash, balsa, bass, birch, cherry, cypress, locust, mahogany, maple, oak, poplar, red cedar, red gum, redwood, sap gum, yellow pine, walnut, white pine

In ordering pine, mill run, kiln dried will be found suitable for carpentry, while short, select, kiln dried, 4 in. and wider or No. 1 shop common, kiln dried will be required for cabinetmaking and patternmaking

Hardwood, for furniture, should be specified first and second grade, kiln dried, standard widths and lengths, or short lengths

MOLDINGS

NAILS
- *a*) Common, 6d, 8d, and 10d
- *b*) Flathead, 1/2 in. No. 20, 3/4 in. No. 19, 1 in. No. 18, 1 1/4 in. and 1 1/2 in. No. 16, and 2 in. No. 14
- *c*) Finishing, 4d, 6d, and 8d

OIL
- *a*) Linseed, boiled
- *b*) Linseed, raw
- *c*) Machine
- *d*) Rubbing

OVERLAY CARVINGS

PANEL OR PLYWOOD — 3 ply, 5 ply, and 7 ply

PATTERN LETTERS

PINS — escutcheon

PUMICE STONE — No. 0

RAPPING PLATES

ROTTENSTONE

SANDPAPER — Garnet cabinet paper, 3/0, 2/0, 0, 1/2, 1

Garnet finishing paper, 6/0, 4/0

Garnet paper can also be obtained in rolls of 50 yd. in widths 4 in. up to 48 in. Narrower widths on special order

SCREW EYES

SCREWS
- *a*) Flathead, brass, No. 3 by 3/8 in., No. 4 by 1/2 in., No. 5 by 5/8 in., No. 5 by 3/4 in., No. 6 by 3/4 in., No. 7 by 7/8 in., No. 8 by 1 in., No. 10 by 1 1/4 in., No. 10 by 1 1/2 in., No. 12 by 1 1/4 in., No. 12 by 1 3/4 in., No. 10 by 2 in.
- *b*) Flathead, bright, No. 3 by 1/2 in., No. 4 by 1/2 in., No. 6 by 3/4 in., No. 7 by 7/8 in., No. 8 by 1 in., No. 10 by 1 in., No. 8 by 1 1/4 in., No. 10 by 1 1/4 in., No. 14 by 1 1/4 in., No. 10 by 1 1/2 in., No. 12 by 1 1/2 in., No. 10 by 1 3/4 in., No. 12 by 1 3/4 in., No. 10 by 2 in., No. 12 by 2 in., No. 14 by 2 in., No. 12 by 2 1/4 in., No. 14 by 2 1/4 in., No. 14 by 2 1/2 in.
- *c*) Oval head, brass, No. 5 by 3/4 in., No. 6 by 3/4 in., No. 7 by 7/8 in., No. 8 by 1 in., and No. 10 by 1 1/4 in.
- *d*) Roundhead, blued, No. 3 by 3/8 in., No. 3 by 1/2 in., No. 5 by 3/4 in., No. 6 by 3/4 in., No. 7 by 7/8 in., No. 8 by 1 in., No. 10 by 1 1/4 in., No. 10 by 1 1/2 in., No. 12 by 1 1/2 in.
- *e*) Roundhead, brass, No. 3 by 3/8 in., No. 4 by 1/2 in., No. 4 by 5/8 in., No. 5 by 3/4 in.

SHELLAC
- *a*) Orange, cut 4 lb. to the gal.
- *b*) Sticks, assorted colors
- *c*) White, cut 4 lb. to the gal.

NOTE: Shellac should be kept in glass or earthenware containers

STAINS — oil, spirit, or water. Fumed oak, dark oak, golden oak, light oak, mahogany, and walnut

STEEL WOOL — No. 0 and No. 2/0

TURPENTINE

TWINE

VARNISH — coach, flat, rubbing, spar, and rubbing

WASTE — cotton, white

WAX — bees and finishing

WHITE LEAD

WALLACE *woodworking* WONDERS

for your shop this year

BETTER CRAFTSMANSHIP
INCREASING ECONOMIES
PERFECT SATISFACTION

WALLACE wood-working machines are truly "wonder-working" machines. Because they turn out such wonderful work! When you INSTALL them — and actually USE them — you will always wonder why you got along without them. They are, indeed, the very ACME of Quality, Strength, and Performance!

(Above)

WALLACE NO. 11 — UNIVERSAL SAW

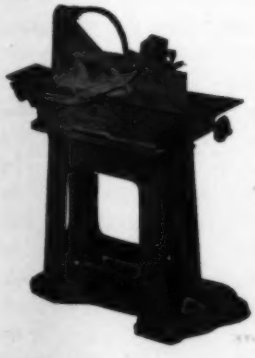
With tilting arbor — cuts are made at any angle. Motor and spindle ball-bearing equipped. Fast, smooth, safe cutting. Gear-driven; motors up to 3-H.P. Economical, accurate

WALLACE

(Below)

WALLACE NO. 10 — 8" JOINTER

20,800 bites per minute with geared motor drive. All-steel cutter-head with four adjustable skew-set knives. No other Jointer equals its faster, smoother performance



(Above)

WALLACE NO. 16 — 16" BAND SAW

New high speed, 1100 r.p.m. gives a blade speed of 4600 lineal feet per minute. Smoother, faster production. Gear drive permits optional speeds. Other distinctive features. Strongly built — to last!

(Above)

WALLACE NO. 9 — MORTISER

All moving parts exactly centered with slide rods insuring accurate and effortless operation. Motor has patented non-leaking bearings; keeps out oil and dust. Bit capacity up to 1" square.

(Above)

WALLACE NO. 28 — HY-GEAR SHAPER

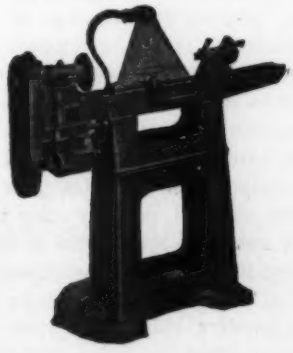
Geared up to a spindle speed of 10,000 r.p.m., this Shaper produces smoother, faster, superior work. Right and left rotation facilitates set-up; eliminates sanding.

WALLACE

(Below)

WALLACE NO. 46 — MULTI-SPEED LATHE

Built on a new principle. Headstock swivels, large face-plate turning done in front of lathe. 9-speeds, uniformly graded, 550 to 2400 r.p.m. Unlimited capacity and versatility



Let us show you why WALLACE MACHINES are built better; why they do better work; and liquidate their installation costs, often in a short time. It always pays to buy the best.

Prompt Deliveries on All Orders

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FOR WOODWORKING AND FARM SHOPS The most complete line offered by one manufacturer.
FOR AUTOMOBILE SHOPS Hammers, chisels, punches, screw drivers, etc.
FOR ELECTRICAL SHOPS Hammers, bit braces, bit extensions, screw drivers.
FOR MACHINE SHOPS Hammers, rules, chisels, punches, levels, etc.
FOR SHEET METAL SHOPS Hammers, chisels, punches, etc.
FOR FORGE SHOPS Anvil tools, tongs, hammers, etc.
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FOUNDRY WORK

(Continued from page 56A)

castings are cleaned, examined, and approved for shipment. Cleaning operations start with the removal of gates and risers which represent the extra metal necessary for pouring the casting to insure its soundness. These are removed with saws, cutting torch, mechanical cutters, or other means. Adhering sand is removed by blasting with metal shot or sand, or by tumbling the castings in a metal barrel turned by a motor. Areas to which gates and risers were attached, and any other rough spots are smoothed by grinding or by means of chisels operated by compressed air. The employees in this department are known as grinders, chippers, blasters, and other names which are descriptive of the equipment they use.

The fifth basic foundry department is the control laboratory or control department. This department is manned by chemists, engineers, metallurgists, metallographers, physicists, and laboratory technicians. Their work is outside of the scope of our present discussion of basic vocational opportunities in a foundry.

The educational requirements for foundry work are as varied as the types of work available. The best foundry workers who usually become supervisors are those who have completed an apprentice training course. Foundry and pattern apprentice courses generally last four years. To be eligible for an apprenticeship, one usually must be a high school or trade school graduate. Apprenticeship for a trade school graduate is often reduced to three years.

Approximately 2300 of the 5600 foundries located in the United States, Canada, and Mexico, offer apprentice training. The nature of the training varies with the size and type of foundry. Small foundries may have apprentice classes of 25 or more. Apprentice courses always include related training. This is special class instruction given in local vocational schools or engineering colleges, or in the plant by regular employees of the foundry.

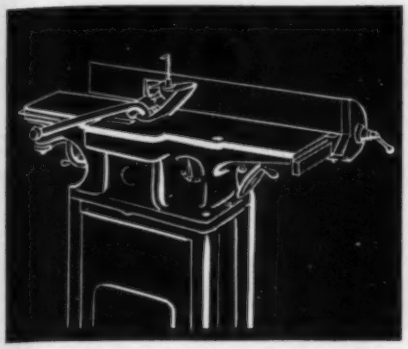
Apprentice training courses include a study of elementary physics, chemistry, mathematics, metallurgy, mechanical drawing, and blueprint reading. Fuels, fluxes, refractories, and metals are studies, and courses in plant layout, mechanized foundry operations, and safety are often included.

Some foundry occupations do not require an apprenticeship or graduation from high school. In foundries where some work is highly repetitive, workers learn to perform certain tasks after a few weeks of intensive training. Short term training used in some foundries fits an individual for limited foundry service by rapidly training him to work at one of several jobs in a single department. The short training period, usually three months, puts the foundry worker on a production wage level in a short time and rapidly provides the foundry with a worker of moderate skill.

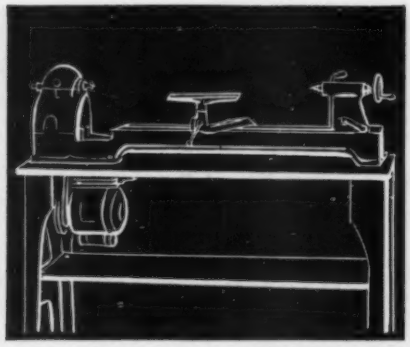
The upgrading system enables workers to get production workers' wages in the shortest time, but such rapidly trained workers have less chance for advancement because they have a minimum of training. Workers trained under an upgrading system spend a few weeks learning a new type of work every time they change to another task in the foundry.

Foundrymen earn wages equal to and above those earned in many other indus-

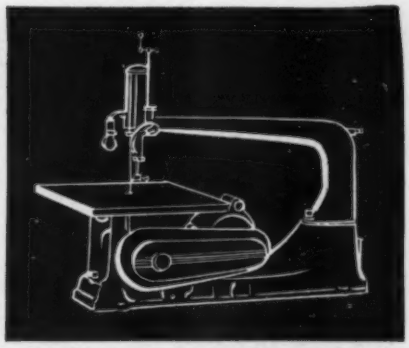
(Continued on page 65A)



6" Jointer For handling narrow strips, planing thin stock, surfacing, and beveling, as well as jointing. Its versatility alone makes this machine a good investment. Dual Purpose Guard speeds planing, protects operator.



Four Speed Lathe Built chiefly for wood turning, cast iron head stock and double row pre-loaded spindle bearings make it an ideal machine for metal spinning. Give your students the advantage of Walker-Turner design!



24" Jig Saw Four operating speeds, easily and quickly adjusted blade tension. Designed to meet the needs of industrial arts and vocational schools. Cuts wood, paper, fibre, plastics, bone, all kinds of sheet metal.

For greater student safety and shop economy specify

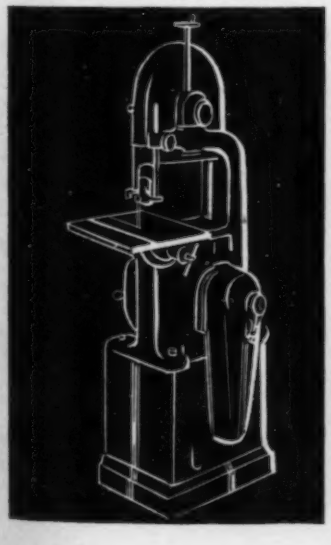
WALKER-TURNER

10" Tilting Arbor Saw

— Students can do better work, learn faster on a Walker-Turner power tool. This Tilting Arbor Saw cuts *exactly*. Controls are conveniently located, for ease of operation. It's well-guarded where it should be guarded, for complete protection. And built throughout for long machine life.

SOLD ONLY THROUGH AUTHORIZED DISTRIBUTORS

16" Band Saw Safety first — and built to last! These are features, too — as important to schools as the speed, accuracy and operating ease of Walker-Turner's new 16" Band Saw. For wood and metal-cutting



15" Drill Press Use it for drilling, sanding, mortising, grinding, spot polishing metal surfaces (of machines), removing rust and scale, or shaping ornaments — this versatile power tool is a school shop in itself!

WALKER-TURNER
walker-turner DIVISION
KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

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DRILL PRESSES • RADIAL DRILLS • TILTING ARBOR SAWS
BELT and DISC SURFACERS • METAL-CUTTING BAND SAWS
LATHES • SPINDLE SHAPERS • JOINTERS

Train students with the tools they'll use as professionals

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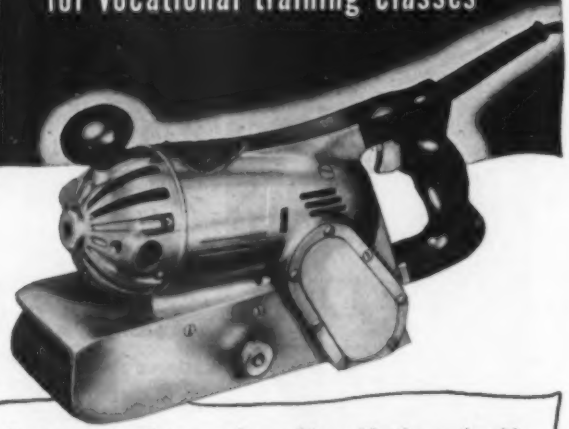
SKIL

Belt Sanders

for vocational training classes



Faster work—finer workmanship with these durably constructed, easily maintained, professional sanders

SKIL 3" BELT SANDER Model 448

Job-proved for producing perfectly smooth finish on all materials . . . wood, metal, and composition. Fast production. Finer workmanship. Comfortable handling. Easiest control. Serves dual school purpose: in vocational class work it provides a professional tool for wood and metal working; in maintenance, it is excellent for refinishing desks, slate blackboards, etc.

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Construction similar to Model 448 with vacuum dust collector added.

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show what the workers do in the vocation, the working conditions, what training is required and where it can be secured, how the high school can contribute to this training, what personal qualities are necessary, and the promotional opportunities in the vocation.

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Few students know where their vocational interest lies and all should be given every opportunity to learn about as many vocations as possible.

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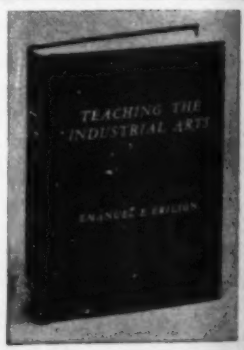
Tells how to simplify, improve and enjoy the job of teaching



TEACHING THE INDUSTRIAL ARTS

". . . without doubt it is the most valuable book on the subject today"—typical comment.

Here is a wealth of suggestions that lead to a more effective and satisfying teaching career. Practical in viewpoint, this professional book deals with teaching SITUATIONS and PERSONAL RELATIONSHIPS. Ten chapters (230 pages) cover teaching activities of the complete year, from appointment to final reports. Nine (132 pages) deal with many of the added responsibilities of the teacher outside the classroom. It's a businesslike discussion from a successful teacher's experience. By Emanuel E. Ericson, Professor of Industrial Education, University of California, Santa Barbara College.

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COURSE MAKING IN INDUSTRIAL EDUCATION

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FOUNDRY WORK

(Continued from page 62A)

tries. Wages vary depending on local conditions, therefore, a specific wage cannot be set for the industry. However, according to recent U. S. Department of Labor statistics, wage rates for male workers in key occupations in machinery industries placed:

Patternmakers above tool- and diemakers.

Bench molders above electricians and welders.

Floor molders and hand core makers above sheet-metal workers, heat-treaters, mechanics, and carpenters.

Machine molders above drill press operators and many other machine tool operators, painters, truck drivers, and stock clerks.

The foundries need thousands of men to bring their working forces up to present requirements. Foundries met wartime demands for castings with small, inexperienced crews by working long hours. Now openings exist for workers in all types of foundry jobs in most of America's foundries. The future of foundry workers is good. A recent government study of the industry indicates that the immediate occupational outlook is favorable. After a number of years of high employment, a moderate decline is expected but employment will remain far above the 1939 level.

Most foundries need workers of some type. To get a position in a foundry, go to the nearest foundry or to a foundry with which you are familiar. Find out what the foundry has to offer you. Look in the want ads of the newspapers for foundries needing workers. The classified section of the telephone book lists foundries, pattern shops, and foundry suppliers. Employment agencies, private and government, often know of openings in foundries.

SIX-INCH JOINTER
5-inch longer tables. 10-inch longer fence (33"). The only 100% rigid fence. Therefore accurate jointing of 25% to 50% longer stock. 2½" dia. one-piece cutterhead. 3" dia. cutting arc.
HELMET HEAD DRILL PRESSES
Over 30 Models—Durable. Sensitive. Larger, longer quills for heavier thrust loads and accurate deep hole drilling and tapping. Involute six-tooth spline drive for freedom from vibration. Balanced for high speeds for reduced drill breakage.
24" x 5" HEAVY DUTY JIG SAW
Cuts plumb when sawing curves. 20" x 20" table. Wider range tension control. Cuts materials up to 3" thick. Handles blades 5" to 9" long. 50% longer blade stroke cuts faster.
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of cutting - shaping - drilling
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• FIBRE
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INTERMEDIATE CAPACITY
POWER TOOLS
SAW-JOINTER WITH TILTING ARBOR SAW
Blade, nut table, tilts. Unique drive permits mounting motor rigidly and separately. Cuts, miters, planes, rabbets, grooves. Longer table and fence. Perfect work on longer stock.
10" TILTING ARBOR SAW
Can be driven by standard motors, even gas engine or line shaft, by using "rolling drive pulley." Motor is entirely separate and away from dust, keeping vibration from the arbor.
HEAVY DUTY 12" x 4" THICKNESS PLANER
50% faster. Powered for output of 14 feet per minute. Planes materials as short as 6½"; hard woods down to ⅛" thick. Built to last on hard jobs.
14-INCH HIGH SPEED BAND SAW
Saws 2 to 4 times faster. Single and 8-speed back geared models for cutting practically any material smoothly and accurately. High safety rating. Tremendous strength.
BELT SANDER-GRINDER
Lowest cost, most compact mill type, hand stroke. Serves as drum sander on contours and irregular shapes. Work is always face up, eliminating guesswork and saving time.
SPINDLE SHAPER
The only shaper having ½" and ¾" cutting arbors formed on a solid one-piece spindle. Stronger. Truer running. Safer. Runs wide mouldings and raised panels in one cut.
SPINDLE SANDER
Sands wood and grinds plastics and metals up to 6" thick, straight and exterior and interior contours to as sharp a radius as ½" and all bevels 0 to 45°.
FRICTION-MATIC WET TOOL GRINDER
Self-adjusting friction roll drive. Peripheral speed remains constant as wheel wears. No water thrown on operator. Larger adjustable tool rest, mounted above grindstone for comfortable operating position and control of pressure.
COMBINATION CONTOUR SAW AND BAND FILER
Ups production as much as 1000%. Accurate. Rugged. Precision filing and file broaching as well as cutting. 8 speeds instantly available—4100 blade f.p.m. down to 92 blade f.p.m.
GAP-BED LATHES
(17" dia. Gap Swing) for wood turning and metal spinning. 33⅓% greater capacity without extra cost. All wanted features, plus longer center capacity and stronger all-steel beds. Two models, 42" and 60" c. to c.

Send for free 44-page catalog No. 50 on Boice-Crane Tools.

BOICE-CRANE COMPANY

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News Notes

♦ At the request of a number of labor-management apprenticeship committees, the California State Department of Education has undertaken the task of preparing a series of instructional books for use by apprentices in various trades.

The first of these sets of books for apprentices in the molding and coremaking craft is now available, and can be obtained by any foundry group wishing to use them in their apprentice or other training program.

Other apprentice instructional material for the apprentices in the plumbing and pipe-fitting craft, radio repair and servicing, meat cutters, and plastering also are ready for distribution.

A guidebook explaining how to use the instructional materials has been prepared and published by a private publisher, the American Technical Society, Drexel Avenue at 58th Street, Chicago, Ill., under the title "Teaching Apprentices." Anyone interested in obtaining this guidebook may do so by directing their inquiry to this firm. The price is $3.

♦ What apprenticeship is, the trades and industries in which there are the greatest opportunities for young men who qualify for this all-round training, are explained in a four-page review entitled *Apprenticeship — What It Is and What it Offers,* reprinted from *Occupational Trends.* Copies may be obtained from the U. S. Labor Department's Bureau of Apprenticeship. Also explained are the qualifications necessary to be accepted as an apprentice and where to apply; the difference between apprentice training for all-round work in a skilled trade and training for jobs requiring only limited skill; and the importance of apprenticeship in the development of skilled man power in defense production plants.

Copies of this reprint can be obtained free of charge by communicating with Bureau of Apprenticeship, U. S. Department of Labor, Washington 25, D. C.

♦ Secretary of the U. S. Department of Commerce, Charles Sawyer, Washington 25, D. C., announced today the establishment of a service in the Department of Commerce to help the public guard voluntarily against the release of technological information which would endanger

(Continued on page 66A)

PAXTON LUMBER

Specially Selected for Industrial Arts use

There's a great deal of satisfaction as well as economy in having reliable lumber to work with in a modern school shop. Many instructors are choosing PAXTON these days because it meets all the requirements of first quality materials, proper grading, and uniformity. These features help students create more attractive, professional-looking projects.

We are prepared to supply you at all times with many kinds of highest quality materials, measured and graded in the best interpretation of current national grading rules.

We also offer:

- Ball Bat Blanks
- Formica
- Bed Panels
- Furniture Squares
- Bed Slats
- Glues
- Boat Panels
- Rez
- Sample Sets
- Closet and Chest Lining
- Table Legs
- Walnut-Cedar Chest Sets
- Dowels

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Kansas City, Kansas — Packers Station

NEWS NOTES

(Continued from page 65A)

the national security. The establishment of this service followed a study and recommendations made by the Interdepartmental Committee on Internal Security, a committee of the National Security Council.

This service, to be operated through the Department's Office of Technical Services (OTS), will provide a central place to which state and local officials, representatives of private businesses, other organizations, and private citizens may write for guidance as to whether specific technological information which is not subject to formal security regulations should be released, withheld, or given only limited distribution.

♦ *Arc Welding Lessons for School and Farm Shop* is a text designed for vocational-agricultural high schools, colleges teaching agricultural engineering, and farmers. It contains 8 informational and 17 operational lessons, 343 pages, and over 550 photographs, drawings, and tables. Its cost is $1 in the U. S. A., and $1.50 elsewhere, postage prepaid; published by *The James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio.*

♦ A pocket-size pamphlet, "Apprenticeship Pays Dividends" — three-minute reading time — outlines ten ways in which apprenticeship nets worth-while returns. Listed in the pamphlet are other publications on the subject of apprenticeship which may be obtained from the Bureau of Apprenticeship, U. S. Department of Labor. Also listed are the regional offices of this bureau and state apprenticeship agencies.

Copies of this pamphlet may be obtained free of charge by writing to the Bureau of Apprenticeship, U. S. Department of Labor, Washington 25, D. C.

♦ The role of hardwoods in modern living will be dramatically portrayed in an educational exhibit for students and other visitors to the famous Museum of Science and Industry in Chicago.

An important phase of the exhibit will be devoted to the biology of wood, while other sections will show how choice woods are transported from far-flung forests of the world to the mills and processed into lumber, plywood, and wood veneer.

The hardwoods exhibit, to be unveiled by mid-1951, will show, step by step, the progress of the wood from its growth as a tree to its final processing as lumber, plywood, and veneer. An animated tree in the biology section will demonstrate the chemical action which occurs in the growing process. Cell and leaf structure will be shown, together with the various stages in the growth of trees, component ingredients and all other aspects of the physical make-up of wood.

Animated scale-model plants will demonstrate lumber, veneer, and plywood production. Every step will be illustrated, from the sawmill, through a lumberyard, a veneer mill and plywood mill, accompanied by a sound recording which will explain each operation. Color pictures of actual plant operations also will be shown on a full-sized movie screen.

Logging and forestry methods will be seen in another section of the exhibit. Here, the visitor will have an opportunity to learn the parts of the world from which various wood species are obtained. Featured will be an 8-ft. globe with panels of many different hardwoods. By pressing a button on the panel, the spectator will illuminate on the globe the country from which that particular wood is originated.

♦ A number of selected case histories in efficiency and economy are presented in a 40-page booklet — "Modern Techniques in Aircraft Manufacturing" — issued recently by The Glenn L. Martin Company, Baltimore.

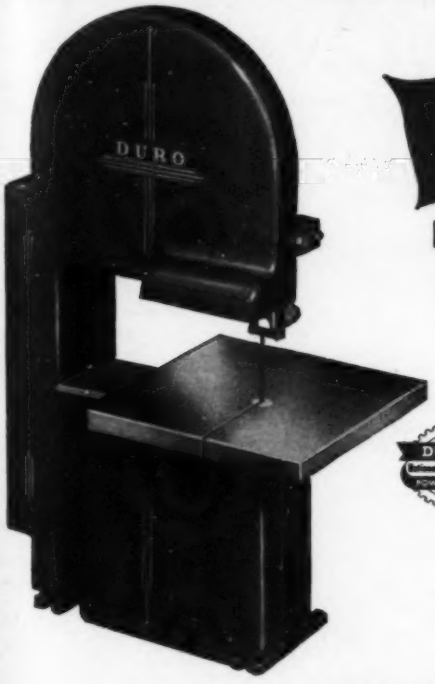
The articles cover such standard phases as budgetary and production schedule controls. They document the various working programs within the engineering, tooling, and manufacturing departments, whereby economy measures are systematized and enforced.

Specific topics are: budgetary system, facilities procurement controls, shop familiarization, design cost control, standard processing, tool planning, blueprint reproduction economies, low-cost lofting, tool manufacturing methods, production short cuts, worker participation, better machine-shop practices, surplus and scrap salvage, in-plant transportation, money-saving maintenance, heating and air-conditioning economies, and the Martin Control (Chart) Room.

♦ A prize contest is sponsored by the 75th Anniversary Committee of the American Library Association. It is addressed to librarians and nonlibrarians, who are or will become 1951 A.L.A. members.

1. For the best statements in 2000 words or less that illustrate the power of books to influence the lives of men and women — young or old: six prizes as follows: $200 each for the two best statements from librarians who are 1951 A.L.A. members. $100 each for the two best statements from librarians who are not A.L.A. members now, but who join A.L.A. when submitting their contest statements. $100 each for

(Continued on page 77A)



New DURO 12" BAND SAW

. . . Combines

RUGGEDNESS, SAFETY and CONVENIENCE

Offers features you'd expect only on models selling for much more, including: Duro ball bearing blade guides *above* and *below* table, that keep blade running truer and smoother; cast one-piece wheel guard that unlocks quickly for blade changes; heavy cast-iron extra rigid frame; double trunnion table supports; rubber-tired disc wheels mounted on needle type bearings — and many other features.

3 MODELS TO FIT ALL SCHOOL BUDGETS

Duro now offers 10", 12" and 15" band saws — a model to fit every need and budget. A speed convertor for metal cutting available for 12" and 15" models. All models incorporate special DURO school tested features that mean extra bandsaw value for you.

WRITE TODAY
for details, prices and specifications on these new Duro 10", 12", and 15" Band Saws.

DURO METAL PRODUCTS CO.
2652 N. Kildare Ave., Chicago 39, Ill.
Please send me: Full details about the new line of Duro Band Saws.

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FOLEY *Automatic* SAW FILER

Trains Your Students Better - - DOUBLES Life of Your Saws

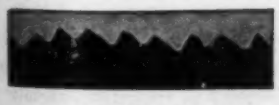
"ONE OF THE BEST MACHINES WE HAVE FOR TRAINING PURPOSES" — Samuel Gompers Trades School, San Francisco

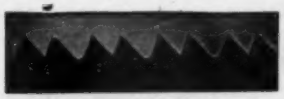
The Foley is the only machine that files and joints all hand, back and mitre box saws from 3 to 16 points per inch, cross-cut circular saws up to 16" diameter (24" optional), and band saws up to 24' long. Patented jointing principle automatically evens up large and small teeth, so saws cut faster, truer, cleaner — stay sharp longer.

With a Foley Automatic Saw Filer you can sharpen your saws more perfectly than is possible by hand. You can do it quicker, — and your saws will stay sharp longer. Your students will turn out better work with sharp saws. ALSO by keeping your saws sharp with a Foley, — you will easily double their cutting life and have less breakage, reducing replacements to a minimum.

Train your students to file saws on a Foley, for they will find thousands of Foley Saw Filers used in industry, Army, Navy, Air Corps, etc. Hundreds of schools and colleges use them to save on saw filing costs and replacement expense.

The FOLEY SAW FILER *Makes . . .*





an OLD SAW . . . . . LIKE NEW!

TYPICAL SCHOOL USERS
Berea College, Berea, Ky., Board of Education, Cleveland, Ohio; Boys Technical H. S., Milwaukee, Wis.; Charleroi School District; Charleroi, Pa.; Redlands Public Schools, Redlands, Calif., Stout Institute, Menomonie, Wis.

30-DAY TRIAL OFFER

You may have the privilege of using a Foley Saw Filer in your own shop for 30 days, — and see for yourself its training advantages and operating economies. Send coupon for details.

Send in this Coupon

FOLEY MFG. CO., 3318 N.E. 5th Street Minneapolis 18, Minn.
Please send literature on the Foley Automatic Saw Filer and details of your 30-Day Trial.

Name.....
Address.....

Print-Shop Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

BELLOWS
- *a*) Hand, small size
- *b*) Electric, blower type

BLACKBOARD — permanent or portable

BOOKCASE — for reference books, catalogs, etc., sectional preferable

BRAYER — 6 or 8 in. for proofing

BRUSHES
- *a*) Bench
- *b*) Benzine, No. 1, oval black
- *c*) Floor
- *d*) Padding, 1½ in. wide

BULLETIN BOARD

CABINETS
- *a*) Galley, for double column, wood or steel, four tiers (to be used with typesetting machines)
- *b*) Galley, for 8¾ in. by 13 in. galleys, wood or steel, four tiers
- *c*) Ink and roller, to accommodate platen-press rollers, wood or steel
- *d*) Matrix, for use with typesetting machines only
- *e*) Roller, cabinet or rack for cylinder rollers
- *f*) Supply, for leads, slugs, spaces, strip material, with top for lead cutter and mitering machine
- *g*) Type, school type, each to accommodate two California cases, job cases, case slides, galley slide, and copyholder
- *h*) Type, complete with 24 full-size California job cases, with overhead lead-and-slug cases, wood
- *j*) Type, complete with 24 full-size California job cases, double work bank, wood or steel
- *k*) Wood or metal, for filing class records, instruction sheets, etc.
- *l*) Storage for cuts

CANS
- *a*) Benzine, pint size
- *b*) Benzine, 5-gal. size
- *c*) Kerosene, safety, 1-gal. size
- *d*) Waste can, fireproof, for rags

CASES
- *a*) Blank, full-size, to accommodate ¼-size cases
- *b*) Border, ¼ size, for ornamental borders
- *c*) Lead and slug, regular size, to hold laborsaving fonts of leads and slugs
- *d*) Metal furniture, to hold laborsaving fonts
- *e*) Rule, ¼ size, for brass rule

CHAIRS — teacher's and tablet arm

CHASE RACKS
- *a*) For platen presses
- *b*) For cylinder presses

CHASES
- *a*) For each size of platen press
- *b*) For cylinder press

COMPOSING STICKS — 6 by 2 in., 8 by 2 in., 12 by 2 in., and 18 by 2 in., adjustable

CUTTER
- *a*) Lead and rule
- *b*) Paper, lever type, 20 in., with pedestal. Should handle 20 by 26-in. sheet
- *c*) Paper, lever type, 26 in. or 30 in.
- *d*) Paper, lever type, 30 in., with divided back gauge
- *e*) 30 in. to 36 in. power cutter

DESK
- *a*) Bindery, 80 by 36 in.
- *b*) Drying rack
- *c*) Imposing, 51 by 39 in.
- *d*) Make-ready, 32 by 24 in .
- *e*) Paper cutters, 80 by 36 in.
- *f*) Proofreaders
- *g*) Teacher's

DRYING RACKS
- *a*) Combination drying rack and stock table for platen presses, 30 trays
- *b*) Trays, interlocking, for cylinder press

FOLDING BONES — for hand folding

FOLDING MACHINE — 20 by 26-in. size, 4 fold, two parallel and two right-angle folds, power

FURNITURE — iron, 2 by 4 to 10 by 15 picas

GALLEYS — Steel, 8¾ by 13 in., 6¼ by 23½ in., double column, and 12 by 18 in.

GAUGE PINS — spring tongue

GLUE POT — electric, 1-qt. size

IMPOSING TABLES
- *a*) 12 by 18 in., with iron top, including reglets and furniture
- *b*) 24 by 36 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
- *c*) 36 by 48 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
- *d*) 39 by 63 in., with iron top, complete with drawers, letter boards, reglets, and furniture

INK FOUNTAINS
- *a*) Short, for 8 by 12, 10 by 15, and 12 by 18 presses
- *b*) Long, for 10 by 15, and 12 by 18 presses

KNIVES
- *a*) Overlay, for make ready
- *b*) Ink, 6 in. and 8 in.
- *c*) Ink, 8 in., square end

LEADER BOXES

LEADERS
- *a*) 6, 8, and 10 pt., fine dot
- *b*) 8 and 10 pt., hyphen

LINE GAUGES
- *a*) Metal, brass, or steel
- *b*) Wood

MALLET

METAL FURNACE — for recasting and refining type metal, used only with typesetting machines

MITERING MACHINE

NUMBERING MACHINES
- *a*) For use on presses
- *b*) Hand machines

ORNAMENTS
- *a*) Assorted floral and decorative designs
- *b*) Border, 6 and 12 pt., decorative

PAPER-DRILLING MACHINE

PERFORATOR
- *a*) 24 in., foot treadle
- *b*) 28 in., foot treadle

PLANER
- *a*) Mallets, hickory or fiber
- *b*) Proof, maple, with felt bottom
- *c*) Type, maple with leather top

PRESSES
- *a*) Cylinder, two revolution, four roller, 17 by 22, complete with variable-speed motor, cast rollers, etc.
- *b*) Platen, 8 by 12, with foot treadle, counter, flywheel guard, platen guard, brake, and set of cast rollers (motor and treadle combination if desired)
- *c*) Platen, 10 by 15, complete with variable-speed motor, counter, flywheel guard, brake, and set of cast rollers, etc.
- *d*) Platen, 12 by 18, complete with variable-speed motor, counter, flywheel guard, platen guard, brake, and set of cast rollers, etc.
- *e*) Proof, 14 by 18, with cabinet
- *f*) Proof, 20 by 24, with cabinet
- *g*) Proof, 23 by 24½, with cabinet
- *h*) Tableting

PUNCH
- *a*) Foot power, multiple with assorted punches
- *b*) Lever, two die, with assorted punches
- *c*) Power, multiple, with assorted punches (paper drill may be substituted)

QUOINS
- *a*) Sizes No. 1 and No. 2
- *b*) Keys, Sizes No. 1 and No. 2

RULE — plain and brass (fonts to fit quarter cases)
- *a*) 2 pt., laborsaving, hair line, side face
- *b*) 2 pt., laborsaving, 1 pt. side face
- *c*) 1 pt., laborsaving, 1 pt. face
- *d*) 2 pt., laborsaving, double face

SAW TRIMMERS — pedestal type, with point gauge, and raising and lowering table

SILK-SCREEN UNIT

SPACING MATERIAL
- *a*) Iron furniture, as selected
- *b*) Leads, laborsaving, 2 pt.
- *c*) Leads, 2-ft. strips, 2 pt.
- *d*) Slugs, laborsaving, 6 pt.
- *e*) Slugs, 2-ft. strips, 6 pt.
- *f*) Spaces and quads
- *g*) Thin spaces, brass and copper, assorted sizes, 6 to 8 pt., one size in each box

SPECIMEN DISPLAY BOARD

STAPLE BINDER — pedestal type, foot power

STEREOTYPING UNIT, 8 by 12 in.

STITCHER — wire, power, capacity ½ in. or ¼ in., flat- and saddle-back tables

TWEEZERS — 3½ in.

TYMPAN PAPER (with combination holder and cutter)
- *a*) 18 in.
- *b*) 38 in., upright, to be used with cylinder press only

TYPE
- *a*) Body, lightface — 8 and 10 pt.
- *b*) Job lightface — 6, 8, 10, 12, 14, 18, 24, 30, 36, and 48 pt.
- *c*) Job, lightface italics — 8, 10, 12, 14, 18, 24, and 36 pt.
- *d*) Job, boldface — 6 and 8 pt., 12 pt., No. 26; 12 pt., No. 27; 12 pt., No. 28; 18 pt., No. 30
- *e*) Job, light copperplate Gothic — 6 pt., Nos. 1, 2, 3, 4; 12 pt., Nos. 5, 6, 7, 8
- *f*) Job, condensed title Gothic — 12, 18, 24, 36, 48, 60, and 72 pt.
- *g*) Job, text type — 10, 12, 14, 18, and 24 pt.
- *h*) Job, typewriter type — 12 pt. with spaces
- *j*) Job, boldface Italic — 8, 10, 12, 14, 18, 24, 30, and 36 pt.
- *k*) Job, heavy copperplate Gothic

(Continued on page 70A)

SEVENTH- OR EIGHTH-GRADE COURSE IN PRINTING

JEROME LEAVITT
Instructor in Education
Northwestern University
Evanston, Ill.

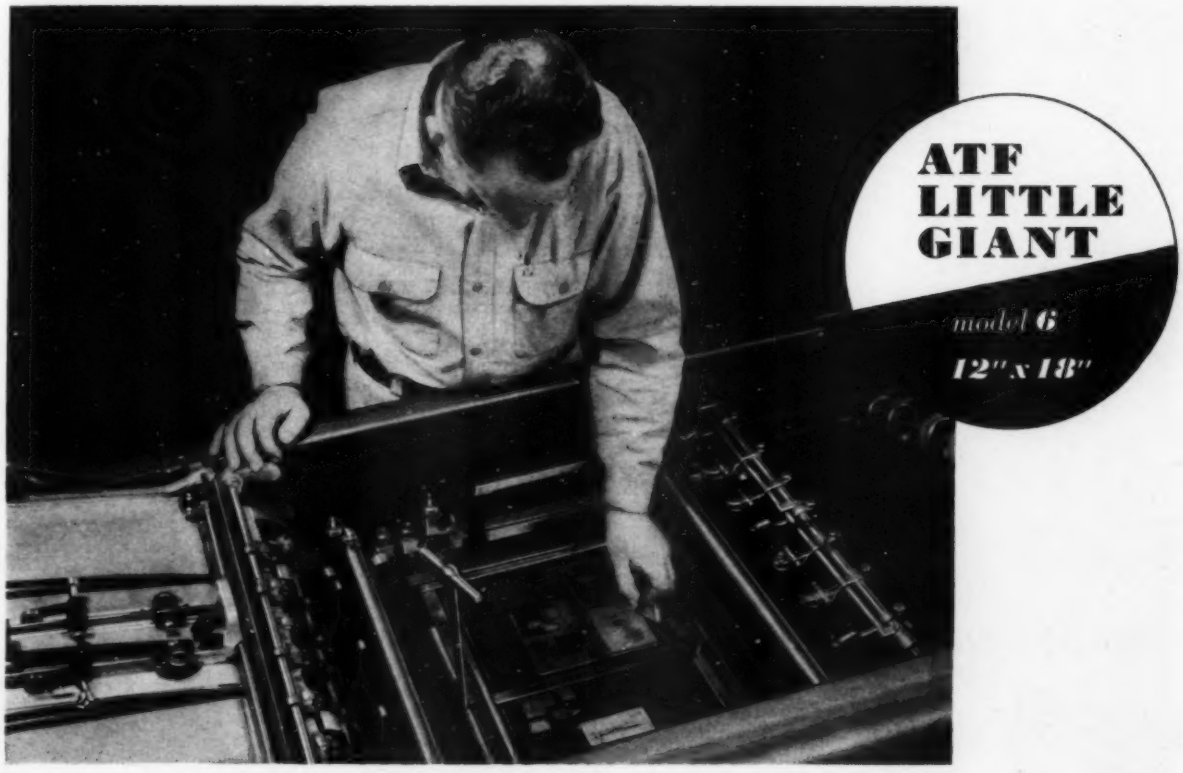
The purpose and aim of printing can best be presented by quoting the last paragraph from *Printing Education* published by the American Type Founders. It reads as follows:

> Printing, with its wide variety of major activities provides for many types of individual differences. For example, press work will appeal to the mechanically minded pupil, while editorial work, proofreading, and composition will interest the literary minded. The artistic type of pupil will find special interest in the illustrating, typography, and layout work, while the organization and management of the school paper will require and develop certain leadership qualities. In other words, the printing laboratory with its wide variety of major activities, is rich in mechanical, artistic, literary, social, and informational values, all of which are vital to worth-while living.

The objective of a course in printing might be said to be contained in the seven cardinal principles of education, namely:

(Continued on page 73A)

A natural for
TEACHING PRINTING...



THE vocational student of today is the craftsman of tomorrow. His ability to handle commercial printing equipment then will depend on how practical is the press he learns on now. It is for this fundamental reason that the 12" x 18" ATF Little Giant is so remarkably adapted for teaching fine letterpress printing. It offers such a breadth of practical training that its modest investment is readily justified. The ATF Little Giant is widely used in commercial shops, and includes every cylinder press facility that the future craftsman will meet in shop practice.

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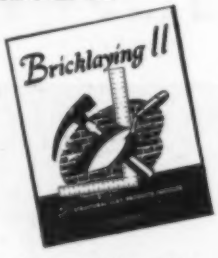
Just Off the Press!

BRICKLAYING II



The second of three volumes designed to provide a complete course of instruction for training in bricklaying. As in Bricklaying I*, this second text follows a *unit pattern*. Each unit includes Information Sheets covering: Masonry Materials; Tools, Equipment and Safety; Trade Mathematics; Trade Drawing; Related Blueprint Reading; Details of Construction; and Shop Practice Job Sheets. Blueprints are provided within the text for easy accessibility, and complete test problems for each unit are included.

Bricklaying II, Units XIV-XXI, covers: Chimney Construction; Glass Block Construction; Limestone Construction; Bonds; Arches; Jack Arches; Cavity Walls; Reinforced Brick Masonry Construction.

203 pages, illustrated, blueprints	$3.50
DeLuxe Clothbound Edition	4.25
*BRICKLAYING I, Units I-XIII	3.00
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(BRICKLAYING III — ready in March 1951)

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INDUSTRIAL HIGH SCHOOL
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Workbook I, Units A-C, 33 plates	$1.35
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Workbook III, Units H-J, 35 plates	1.45
Workbook IV, Units K-P, 41 plates	1.55
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ALBANY 1, NEW YORK

(Continued from page 68A)

— 6 pt., Nos. 21, 22, 23, and 24; 12 pt., No. 25
l) Wood, condensed Gothic — 8, 12, 15, and 18 line
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v) Laborsaving metal furniture
w) Thin spaces with quarter-size case

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a) Either linotype or intertype, 2 or 3 magazines, and molds
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BENZINE OR GASOLINE — for cleaning type or presses
BINDERY TAPE — 2 in. wide, brown or black
GOLD BRONZE — pale
INK
a) Bond, black, for bond papers
b) Book, black, for school papers, etc.
c) Cover, colors as selected
d) Dryers and compounds, as selected
e) Half tone, black
f) Job, colors as selected
g) Metallic, gold and silver
h) Process, black, red, yellow, blue

KEROSENE — for cleaning rollers
PADDING CEMENT
a) Cold
b) Hot

PAPER
a) Bond, fine grade, 17 by 22 — 20, white
b) Bond, medium grade, 17 by 22 — 20, white
c) Bond, sulphite, 17 by 22 — 20, white
d) Bond, sulphite, 17 by 22 — 20, colors as selected
e) Book, enamel, 25 by 38 — 80, white
f) Book, machine finish, 25 by 38 — 80, white
g) Book, eggshell finish, 25 by 38 — 60, white
h) Cover, as selected, 20 by 26, medium
j) Card Bristol, fine grade, 22 by 28 — 4 ply, white
k) Index Bristol, medium grade, 25½ by 30½ — 110, white
l) Index Bristol, medium grade, 25½ by 30½ — 140, white
m) Mill Bristol, medium grade, 25½ by 30½ — 140, colors as selected
n) Pressboard, red
o) Strawboard, No. 40 or No. 50
p) Tagboard, manila, 24 by 36 — 140
q) Tympan, to fit presses
r) Wrapping paper, size as selected
s) Holder for same

PASTE
a) Bindery
b) Make ready

SILK-SCREEN SUPPLIES consisting of:
a) Silk-screen process paste paint, 1 each of the following colors: toluidine red, strontian yellow, ultramarine blue, medium green, rich brown, orange, purple, white, and black
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c) 8-in. synthetic squeegee
d) 11-in. synthetic squeegee
e) No-clog varnish
f) Film solvent
g) Stencil filler
h) Filler remover
j) Stencil knife
k) Fiber guides
l) Red sable brush — ½ in.
m) Putty knife
n) Frame tape

TWINE — cotton, for tying jobs
WIRE STITCHING
a) No. 28 round wire for stitcher
b) Wire staples, ¼ in.

Drafting Equipment and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that stills, silent movies, or sound movies, may be used also in the student's industrial arts and vocational education courses.

ADJUSTABLE-CURVE RULER
BEAM COMPASS
BENCH BRUSHES
BLACKBOARD
a) Permanent or portable
b) Compass, 15 in., with locking device
c) Drawing set: T square, straightedge, triangle, and protractor

BLUEPRINT
a) Frame or machine
b) Washing trays or washer
c) Paper tube, airtight
d) Drying rack or dryer

BOOKCASE
CABINET
a) For filing drawings

(Continued on page 72A)

Fair weather ... or foul?

No matter what the future may bring, the most important single thing to the student of today is the development of skill. Not only will it make a difference in his success in peace time . . . but, what he learns today may well be the thing that saves his life and that of his country tomorrow.

Whatever decisions you may have to make to better fit him for coming problems and changes—your *best* plan is to anchor that skill through the use of adequate materials and tools.

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(Continued from page 70A)

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c) For storing drawing instruments
d) For storing models

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DESK — teacher's
DIVIDERS — proportional
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DRAWING BOARDS — large
DRAWING-BOARD SUPPORTS — to be set on or attached to woodworker's bench
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b) For teachers
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LETTERING ANGLES
LETTERING PENS — assortment of 12
LEVEL OR TRANSIT — builders' for architectural students
LEVELING ROD — for use with the transit
MACHINISTS' COMBINATION SET — 12 in.
MARKING PINS — for use with measuring tape, for architectural students
MICROMETER — 1 in., for mechanical-drafting students
OILSTONE — 3-in. case
PANTOGRAPH — 21 in.
PARALLEL RULES
PLANIMETERS
PLUMB BOB
SHEARS — for trimming blueprints and drawings
SPEED COUNTER — for mechanical-drafting students
STEEL SCALES — 12 in.
STOP WATCH — for mechanical-drafting students
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a) For cutting and trimming drawings and blueprints
b) For disassembling and reassembling machine parts and models
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a) 100 ft., steel, for architectural students
b) 50 ft., steel or metallic
TOOLBOX — containing 1 machinists' hammer, one 6-in. adjustable wrench, one 6-in. screw driver, one 6-in. combination pliers
TRIANGLES
a) 30–60 deg., 14 in. transparent
b) 45 deg., 10 in. transparent
TRIANGULAR SCALES — civil engineers' type, 12 in.
T SQUARE — adjustable or fixed head, for large drawing board or straightedge with parallel rule attachment for large drawing boards
WALL CHARTS — lettering, decimal equivalents, etc.
YARDSTICK
To be provided by, or for, each student

Drafting — Small Equipment

DRAWING BOARD — size to be specified by instructor
DRAWING INSTRUMENTS — as specified by instructor
ERASING SHIELD
IRREGULAR CURVE — Nos. 8 and 13, transparent
PENCIL COMPASS
PENHOLDER — for lettering pens
PENS — assorted, for lettering
PROTRACTOR — not over 5 in.
SCALE — 12 in. architects', triangular
SCALE GUARD
SLIDE RULE — 10 in., as specified by instructor
T SQUARE — to fit drawing board
TRIANGLES — 30–60 deg., 10 in. transparent, and 45 deg., 8 in. transparent

Drafting Supplies

BICHROMATE OF POTASH — crystals
BLUEPRINT
a) Paper, 36 in. wide
b) Writing fluid
PAPER
a) Cross section, 8½ by 11 in.
b) Detail, 24 by 36 in.
c) Drawing, 24 by 36 in.
d) Isometric, 7 by 10 in.
e) Tracing, 36 in.
POWDER — for tracing cloth
TRACING CLOTH — 36 in.
VAN DYKE
a) Fixing salts
b) Paper, 36 in.
c) Writing fluid

Drafting — Additional Supplies

To be provided by, or for, each student
ERASERS
a) Cleaning
b) Ink
c) Pencil
INK
a) Black, waterproof
b) Colored, if required
PENCILS — DRAWING, HB, 2H, 3H, 4H, and 6H
PENCIL POINTER PAD
THUMBTACKS OR SCOTCH TAPE

PRINTING – GRADES SEVEN AND EIGHT

(Continued from page 68A)

1. Health and safety
2. Worthy home membership
3. Mastery of tools, technique, and spirit of learning
4. Vocational and economic effectiveness
5. Faithful citizenship
6. Wise use of leisure
7. Ethical character

or, it might be included in the following areas:

1. Recreation
2. Therapy
3. Expression
4. Exploration

To expand and clarify these, the following list of 18 objectives has been compiled. These objectives fall into and cover both classifications.

1. To make life more meaningful through offerings of this department.

2. To aid in the proper guidance of each student; to more nearly insure a well-rounded and cultured individual.

3. To develop in each pupil an appreciation of good workmanship and good design.

4. To increase the area of experience by assigning new problems which are to be solved.

5. To create situations where constant growth is felt by student and no feeling of failure prevails.

6. To express individualism through knowledge and the use of materials, processes, and tool manipulations.

7. To serve as an experimental laboratory to develop creative ability.

8. To recognize the artistic and mechanical value of manufactured articles.

9. To acquire industrial knowledge for general information.

10. To develop in each pupil an attitude of pride or interest in his ability to do useful things.

11. To discover latent traits and provide opportunities for development.

12. To develop habits of neatness, accuracy, and perseverance in the performance of all tasks.

13. To recognize the real value of tools and materials.

14. To develop social values of courtesy, politeness, agreeableness, honesty, co-operation, etc.

15. To develop in each pupil a thoughtful attitude in the matter of making things easy and pleasant for others.

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Make-Up Rule
Line Gauge
Sennett Positive Assembler
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Lino Slug Cutter
Type Mortiser
Form Truck
Tympan Paper Holder-Vertical or Horizontal
Press Seat
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50 YEARS OF SERVICE TO THE PRINTING INDUSTRY

16. To develop the power to visualize and feel confident that the finished task will be the desired outcome.

17. To develop discrimination in purchasing and the intelligent use of commodities.

18. To develop in each pupil an attitude of readiness to assist others when they need help, and to provide opportunities to join in group undertakings.

This course in printing for the boys of the seventh or eighth grades will consist of planning work, hand composition, press work, related information, and allied activities.

Some service skill and information is necessary to do the work outlined in this course and to attain the objectives listed. These are as follows:

1. Locate any letter or character in case.
2. Plan a job.
3. Set the composing stick to measure.
4. Hold a stick.
5. Set type (straight matter).
6. Take a proof on a proof press.
7. Make corrections.
8. Tie up a form.
9. Distribute type.

(Continued on page 74A)

Looking for an Art Department BUDGET-STRETCHER?

Hamilton has the answer!

Hamilton
Student Table
V-1704

What's so sensational about the V-1704? Not a thing! It's just a mighty fine student drawing table available at a surprisingly modest price. Solidly built of Northern Wisconsin Birch throughout, and attractively finished in Golden Brown, the V-1704 offers easy, fool-proof top adjustment without clumsy protruding levers. Both tilting and stationary tops are generous work-size, and tilting top is equipped with an adjustable paper ledge. Stationary top furnishes generous reference surface for colors, etc.

There's a *built-in bonus* of quality in all Hamilton school equipment—the result of Hamilton's unmatched experience and manufacturing facilities. So whether you're buying a single table or completely equipping a new art room, find out more about the Hamilton V-1704 student drawing table. A similar table 36" long x 24" wide by 30" is listed as No. V-1703. Write for full details and prices today.

	LENGTH	WIDTH	HEIGHT	DEPTH
Overall	34"	20"	30"	
Drawer	14½"	9"		2⅛"
Adjustable Top	24"	20"		
Stationary Top	10"	20"		

Hamilton
MANUFACTURING COMPANY
Two Rivers, Wisconsin

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PRINTING — GRADES SEVEN AND EIGHT

(Continued from page 73A)

10. Wash type and rules.
11. Move job from stone to galley.
12. Lay out the job.
13. Lock up form for the platen press.
14. Ink up a press.
15. Wash up a press.
16. Feed a job press.
17. Figure paper.
18. Do hand folding.
19. Cut paper.

To derive all possible benefits from a course in printing and attain the desired ends, certain units of materials are used to work with. These are:

1. Tools and equipment
2. Materials used in processes
3. Exhibits and technical material
4. Examples of printed matter
5. Magazines
6. Books

Satisfactory work cannot be done by using only one or two of these, but it will result from a use of a combination of the six.

The following is a list of the approximate tools and equipment needed to start a class of 16 boys. Other equipment to be added as needed and as funds permit:

Type
15 composing sticks
1 proof press
1 imposing table
6 type cabinets
1 press (10 by 15)
1 lever paper cutter
Leads and slugs
Furniture
4 chases
15 galleys
15 pica sticks
10 pairs quoins
3 dozen guide pins
Ink
Paper
Brass and copper thin spaces
Brass rule

In order to have a variety of materials on hand to work with, the following should be kept in stock: paper, cardboard, envelopes, variety of type, surplus equipment, etc. Various other types of materials will be purchased as needed by the individual.

Exhibits and materials such as those put out by The American Type Founders and others should be made available to students as they are secured, or as need for this material is felt.

A file of examples of printing, collected from various sources, should be kept so that students may consult it when they are planning a job. It should contain examples of programs, booklets, tickets, posters, letters, etc.

Magazines such as INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, professional magazines in printing, and school journals should be subscribed to and kept together for reference.

A reference library of books on printing of interest to seventh-and eighth-grade students should be started and added to as funds permit. Books such as *The Practice of Printing* by Polk, *Progressive Lessons in Printing* by Bohrer, *Printing Job Sheets* by Hague, and *Text Book of Printing Occupations* by Hague should be included.

Lectures, demonstrations, and other classwork is not outlined as a separate part of this course because, as the students' interest is aroused, the necessary demonstrations and talks should be given to the group, or to a part of the group, as the need arises.

* * *

During peak periods of World War II, when the U. S. aluminum industry produced more than 2¼ billion pounds of aluminum in a year, more electricity was consumed for aluminum production in one day than would normally be used by a city of 60,000 homes in an entire year.

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FOR THE STUDENT

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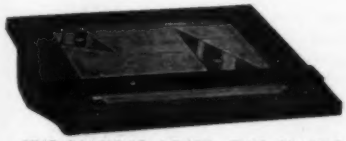

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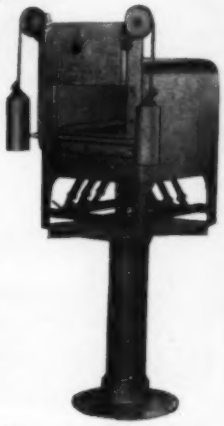
MACHINE TOOL DIV. Kalamazoo TANK and SILO CO.

347 HARRISON STREET, KALAMAZOO, MICHIGAN

EASY FAST

Now ONE Furnace for teaching a variety of heat treating techniques

THE JOHNSON No. 706



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No. 706 Pedestal (illustrated) . . . $278.00

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- •SOLDERLITE—Prefocused spotlight.
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You simplify teaching for yourself and your students—with the *modern* automotive, electrical and radio technician's soldering tool. Streamlined compactness and precision balance make the Weller Gun easy to handle. 5-second heating, trigger-switch control, and dual heat save time and current on *all kinds* of radio, electrical and automotive work. Order your 250-watt Weller Gun from your Distributor, or write for bulletin direct.

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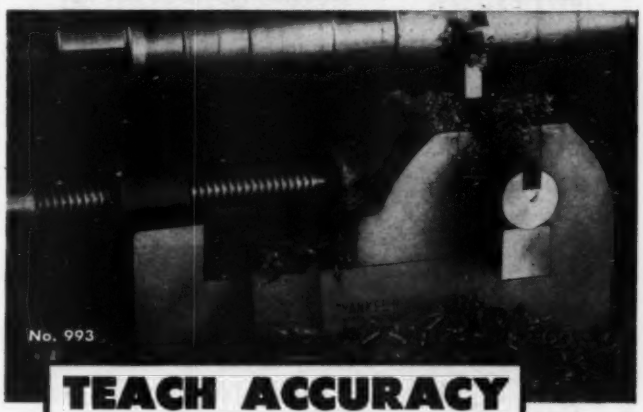

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THE TOOL BOX OF THE WORLD

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NEWS NOTES

(Continued from page 66A)

the two best statements from nonlibrarian citizens who join the A.L.A. when submitting their contest statements.

2. For the best statements in 2000 words or less on the topic: "What are the problems that worry the citizens enough to make him come to the library for help." Two prizes as follows: $100 each for the two best statements from librarians who are members of the A.L.A. or who join the A.L.A. when submitting their contest statements. (Here, we're seeking to know what's on the citizen's mind. How close is the librarian to the thinking of the citizen? We believe that public librarians are very close. You can convince us!)

Deadline: Statements must be postmarked on or before midnight, May 31, 1951. Winners will be announced at the Chicago A.L.A. Conference in July.

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♦ The Rockland County Vocational Education and Extension Board, Rockland County, N. Y., is establishing a new course, "Principles of Making Folding Cartons," at the Piermont High School. This course, which will teach steel rule diemaking, is believed to be the second of its kind in the country. It is being established in co-operation with a local boxmaking concern.

♦ Announcement has been received from John F. Rider, Publisher, Inc., that the new second edition is now available of *Radio Operator's License Q and A Manual* by Milton Kaufman, Instructor, RCA Institutes.

Up-to-date as of September 1, 1950, FCC Supplements, the enlarged second edition has questions and answers on the new element, Element VII: Aircraft Radiotelegraph and Radiotelephone for Flight Radio Operator. It also contains the new Elements II and V, and the Revised Elements III and VI.

Element VII is now required of students to qualify for a flight radio operator's license. Subject matter now includes FM and Television in Elements II and IV. A number of questions have been added to Elements V and VI on such topics as Frequency-Shift Keying, Marine Radar, and Lunar. This book covers these questions and offers an extensive bibliography for those who want additional material.

For further information write to *John F. Rider, Publisher, Inc., 480 Canal Street, New York 13, N. Y.*

♦ Western pine association forester Ernest L. Kolbe reported that eight new Oregon tree farms covering 155,620 acres — including one 84,855-acre tract of the Gilchrist Lumber Company at Gilchrist — were certified during the year to bring the total number to 21 and total acreage to 1,063,127.

The entire region meanwhile added 29 others for a total acreage increase of 358,326, placing the regional total at 305 certified areas covering 3,722,312 acres.

Certification of 19 tree farms covering 165,505 acres gave Idaho the greatest 1950 increase and brought its total to 80 farms and 608,205 acres.

Six Washington certifications were made by the association's forest conservation committee for a total acreage of 9528 and brought that state's grand total to 59 tree farms on 447,890 acres.

Other states included: California — three new tree farms for 23,161 acres, total, 97 tree farms, 670,416 acres; Montana — one new tree farm, 3423 acres, total 47 tree farms, 852,675 acres; New Mexico — none new, total one tree farm, 80,000 acres. — *Western Pine Association.*

♦ A 16-page, multicolored, comic-type booklet entitled "How Does It Work?" has been released by the School Service Department of the Westinghouse Electric Corporation.

The booklet was prepared for use as a teaching aid in science and social science classes of junior and senior high schools. Its purpose is to help students grasp textbook theory by seeing how scientific principles are put to use in nuclear reactors, jet engines, television sets, electronic tubes, electric lights, and elsewhere.

Teachers can obtain copies of the booklet (B-5255) by writing to the School Service Department, Westinghouse Electric Corporation, 306 Fourth Avenue, Box 1017, Pittsburgh 30, Pa.

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ASSOCIATION NEWS

(Continued from page 4A)

Education Department, Albany; Carl E. Frankson, director of industrial arts, State Teachers College, Newark, N. J.; James Hammond, director of industrial arts, State Teachers College, Fitchburg, Mass.; John Hurley, supervisor of industrial arts in elementary and junior high schools, board of education, New York City; Wesley Ketcham, supervisor of industrial arts, Bureau of Youth Services, Hartford, Conn.; Maximillian Komow, assistant administrative director, Bureau of Vocational Activities, board of education, New York City; and John R. Ludington, specialist for industrial arts, Division of Elementary and Secondary Schools, Federal Security Agency, Office of Education, Washington, D. C.

NORTHEASTERN OHIO INDUSTRIAL ARTS ASSOCIATION

One hundred fifty-three members attended the Northeastern Ohio Industrial Arts Association meeting in Akron, Ohio, on Saturday, January 20, 1951. The program was high-lighted by demonstrations by ten master teachers in the field of industrial-arts electricity. New project displays and an illustrated demonstration lecture by Myron Miller of the Ohio Edison Company were special features of the meeting. A conducted tour through the industrial-arts facilities in the new $1,500,000 Ellet Junior-Senior High School was thoroughly enjoyed by the group.—*Duane E. Work.*

Epsilon Pi Tau, Chico State College

♦ Kappa Chapter of Epsilon Pi Tau fraternity at Chico State College, Chico, Calif., initiated 16 new members on December 9, 1950. The installation took place at the Oaks Hotel in Chico followed by a banquet at which Dr. Glenn Kendall, new president of Chico State College, spoke on "The Place of Industrial Arts in the General Education Program."

The new members are left to right: front row: Robert K. Wilson, Gust A. Zagorites, William R. Gray, Ernest S. Massotty, Eugene L. Prentice, Gail J. Phares, Marvin W. Beaumont, Melvin L. Riggins; back row: Stanley L. Miller, Charles A. King, Harvey H. Hanson, Robert J. Kirker, Anthony Vidak, August Winter, Lawrence A. Martin, and Robert J. Romaneck.—*Leslie Ferguson.*

♦ Officers elected for the year 1950–51 at the annual dinner of the Maryland Vocational Association, held at Baltimore, Md., November 3, 1950, are as follows: Gordon E. Medinger, president; Palmer Hopkins, vice-president; Helen T. Hearn, secretary; and James O. Proctor, treasurer.

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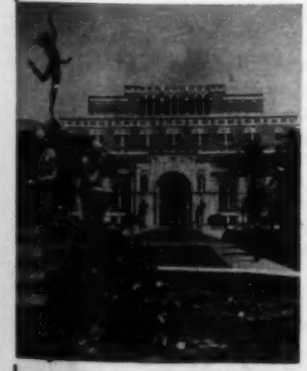

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New Publications

Leaders in Industrial Education

By William T. Bawden. Cloth, 196 pp., 5¾ by 7⅝ in., illus., $3. The Bruce Publishing Company, 400 North Broadway, Milwaukee 1, Wis.

This new book published December 30, 1950, is the type of publication that has been needed for a long time by teachers and students of industrial education. Dr. Bawden, by virtue of his extensive acquaintanceship among leaders in the field extending over many years, his recognized scholarship, and unusual ability as a writer, is doubtless the one person in the United States best qualified to write such a book. It deals with the life, educational philosophy, and work of nine distinguished leaders in industrial education whose combined services extend over the years from 1879 to 1949, but whose influence will continue to be felt for many years to come. The nine men presented to the reader are: Calvin M. Woodward, Charles R. Richards, Frederick G. Bonser, Ira S. Griffith, John D. Runkle, Lorenzo D. Harvey, James H. Stout, William E. Roberts, and F. Theodore Struck. While it obviously was not intended by the author, the book in interesting and clear fashion also gives much of the life, work, and educational philosophy of a tenth distinguished leader not mentioned in the table of contents, namely, William T. Bawden; for the book could well be regarded also as a brief autobiography of the author. This happy outcome is due to the style of writing adopted by Dr. Bawden for his book. He has used the informal, personal-essay style that adds greatly to its interest and charm, and enables him frequently, as though conversing with the reader, to tell of his personal experiences as a friend or admirer of those about whom he is writing, and to interpolate bits of his own educational philosophy as he comments on events and personalities.

This little volume is intensely interesting reading and leaves the reader with an impression of having personally met each of the men dealt with in its pages. As in all his writing, Dr. Bawden has here obviously expended much labor to have his detailed information about persons and incidents accurate and dependable. A careful reading of the book will inevitably cause any teacher of industrial education to feel a surge of pride in his calling because of the company to which he belongs, and it doubtless will prove to be an inspiration to many young men who are preparing themselves to become teachers and leaders in industrial education. The present writer regards this book as a most important contribution to the literature of the field. — *Arthur B. Mays*, Urbana, Ill.

Die Design and Diemaking Practice

Edited by Franklin D. Jones. Cloth, 1014 pp., 6¼ by 9⅛ in., illus. The Industrial Press, 148 Lafayette St., New York 13, N. Y.; Machinery Publishing Co., Ltd., National House, West St., Brighton, 1, England.

A large book packed with encyclopedic information that will be most useful to the die designer and the die sinker.

Armed with this book, the designer can approach the solution of his die design problems with assurance.

The chapters cover making punches and dies for cutting blanks out of flat stock, determining

(Continued on page 82A)

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Only a general knowledge of radio is needed to understand this book. It gives a clear explanation of the operation of F-M circuits to the student or radio man who is familiar with the current AM radio but who does not have the mathematical background necessary for an intensive study of the subject himself. The text includes practical details of installation and servicing. Review questions appear at the end of the book.

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The new edition of this book includes all new designs of basic tool machines. New pictures, diagrams, and exercises in reading precision measuring tools. New shop safety material is given. People buy this book because it is direct, simple, complete, and entirely free from frills. It contains the necessary information for machine shop students along with practical applications. It gives sound training in industrial practices. This text has been officially adopted by the Ford Motor Company.

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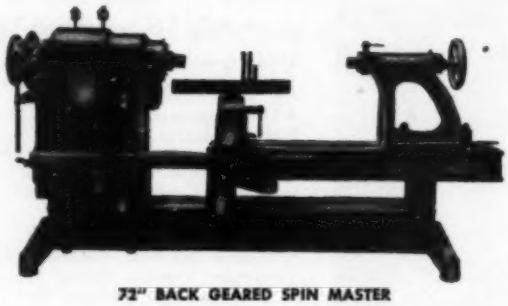

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NEW PUBLICATIONS

(Continued from page 80A)

blank diameters, materials for making dies, the details for punches and dies, stops for controlling stock positions, sectional punch and die construction, blanking dies, piercing and perforating dies, self-guiding dies, wear of cutting edges, bending and forming dies, design information for drawing dies, dies for shallow cups and shells, dies for deep dies, dies for wide flanged shells, conical or tapering forms, deep conical shaped parts, spherical and oval shapes, square and rectangular shapes, use of rubber in punch and die construction, rubber and hydraulic types of expanding dies, dies for inclinable presses, heat-treatment of die steels, and dies for powdered-metal parts.

Author's Guide for Preparing Manuscript and Handling Proof

Cloth, 80 pp., 6⅛ by 9¼ in., illus., $2. John Wiley & Sons, Inc., New York 16, N. Y.

A handy aid for preparing manuscript and handling proofs in the publisher's office; prepare illustrations and choose pictures; check galley proofs, engraver's proofs, and make up dummy pages; proofreading, completing production and copyrighting; and preparing reprints and revisions.

Making Useful Things of Wood

By Franklin H. Gottshall. Cloth, 192 pp., 7⅞ by 10¾ in., illus., $4.50. The Bruce Publishing Co., 400 N. Broadway, Milwaukee 1, Wis.

Another delightful book by this well-known writer of books on woodwork and design.

His latest book contains 33 well-designed articles which students and homecrafters will find pleasure in making for the home.

Besides clear explanatory directions, each article is graphically described in line etchings and half tones. A bill of materials also accompanies each article described.

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The book also contains directions for using and sharpening tools, performing various tool operations, and finishing procedures.

How to Plan and Buy Printing

By R. Randolph Karch. Cloth, 169 pp., 8¼ by 11¼ in., illus., $4.25. Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y.

An excellent book for those who need to know how to prepare manuscript, mark it for the printer, order the various kinds of engravings, select and specify type, and how to proofread the material that has been set up.

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Sheet Metal Shop Practice

By Leroy F. Bruce. Cloth, 251 pp., 5⅝ by 8⅛ in., illus., $4. American Technical Society, Chicago 37, Ill.

An excellent book for the learner and for the mechanic who needs a refresher.

The book describes the hand tools used by the sheet-metal worker, and then shows by illustrated descriptions how each tool is used in performing the various operations.

Pattern development (parallel line, radial line, triangulation) and welding also are described.

TV Master Antenna Systems

By Ira Kamen and Richard H. Dorf. Cloth, 368 pp., 5⅝ by 8⅛ in., illus., $5. John F. Rider Publisher, Inc., 480 Canal St., New York 13, N. Y.

A text which covers the installing, and servicing of TV master antenna systems.

The book is quite comprehensive, and is written for learners, installers, servicemen, and all who need to know about TV master antenna systems.

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We have had it printed under the title, "HISTORICAL NOTE ON DRAWING INSTRUMENTS."

We are aware of the fact that some important details have been omitted. Such omissions are not due to oversight, but in some measure to lack of information. For example, we would like to know how Leonardo da Vinci and his contemporaries fastened a silver point to a compass; but a diligent search through various sources of information failed to reveal this. Answers to this question, or any other information that would lend interest to this paper, will be greatly appreciated and duly acknowledged.

Naturally, the writer of this paper has not neglected the opportunity afforded to say a good word for our own drawing instruments, but we believe that all of the historical material presented is correct.

A number of teachers have requested copies of this "Historical Note" for distribution to their classes in drafting as a means of stimulating interest in their work, and we are taking care of their needs. Should you also wish to have copies for similar use, we will be glad to supply them.

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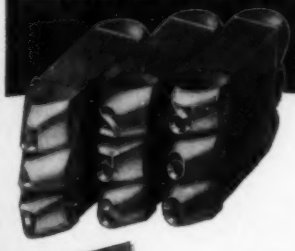

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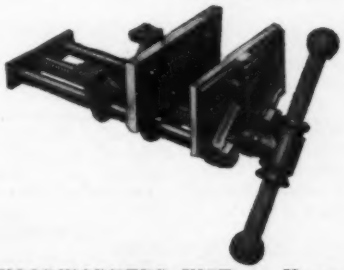

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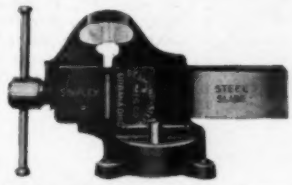

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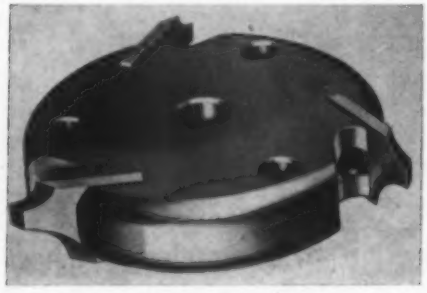
SHOP EQUIPMENT NEWS

NEW DELTA MOLDING CUTTERHEAD

The No. 265 Delta molding cutterhead, manufactured by the Power Tool Division of the Rockwell Mfg. Co., can be used on any circular saw having a double-face fence and 5/8-in. arbor. By the use of this cutter screen-door moldings, picture frames, porch railings, table edges, ornamental moldings, and hundreds of other different shapes and moldings may be cut.



New Delta molding cutterhead

In the Delta molding cutter-head three interchangeable knives are locked into the solid steel head by a special patented method and they cannot come loose. Only their actual cutting edges are exposed which makes the cutterhead extremely safe to operate.

Twenty-seven different sets of knives are available to be used with this cutterhead. Each set consists of three matched blades, made of high-speed steel.

Knife styles include cove, quarter-round, bead, flute, straight, drawer joint, glue joint, wedge tongue, wedge groove, clover-leaf screen molding, ogee, pgee, thumb molding, etc.

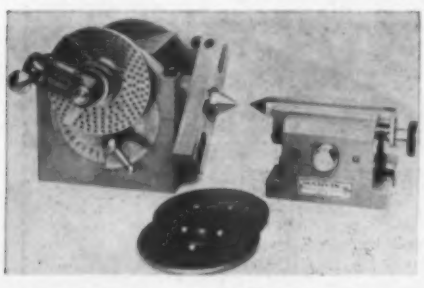
For further information write to *Delta Power Tool Division, Rockwell Mfg. Co., 689 E. Vienna Ave., Milwaukee 1, Wis.*

For brief reference use IAVE — 0301.

NEW DIVIDING HEAD

A new dividing head that provides wide latitude in selecting various divisions to meet specific requirements will shortly be marketed. The unit comes complete with 3 index plates, each plate having 6 sets of holes. It will tilt from 5 deg. below horizontal axis to 30 deg. past vertical axis. The complete dividing head weighs 15 lb.

The tailstock has two pins, which align it in a horizontal position with the headstock. It is vertically adjustable for tapered work. Head has 40:1 ratio. Tail center travel is 1 in. Spindle nose No. 2 Morse taper socket and 1 in. 10 threads. The head is carried on *two* heavy trunions.



New Marvin dividing head

For complete information, write to *H. B. Hazerodt, Director of Sales, Marvin Machine Products, Inc., 414 Ford Building, Detroit 26, Mich.*

For brief reference use IAVE — 0302.

THE NEW DI-ACRO POWER PARTER

The Di-Acro Power Parter has been designed for accurately cutting or "parting off" rods and bars without distorting their roundness or crushing the material.

The Di-Acro power parter is equipped with an air cylinder, cushioned at both ends for quiet and efficient operation, and each cutting cycle is instantly obtained through a four-way foot valve leaving both hands of the operator free to handle the material.

Di-Acro power parter

The scope of operations of this high speed cutting machine ranges from very small rods to 5/8-in. diameter bars and ten holes are provided in the standard cutting head ranging from 1/16 to 5/8 in. in steps of 1/16 in.

Cutting heads for square, rectangular, hexagon, and other shaped bars can be made to order.

For more detailed information write to *O'Neil-Irwin Manufacturing Co., Lake City, Minn.*

For brief reference use IAVE — 0303.

NEW MANUAL ON BENDING OPERATIONS

It's Easy to Bend is the title of a completely new 32-page bending manual which has just been published after a great deal of research by our organization.

This bending manual should be extremely valuable to anyone who is interested in the bending of metals. It is offered gratis to every reader of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

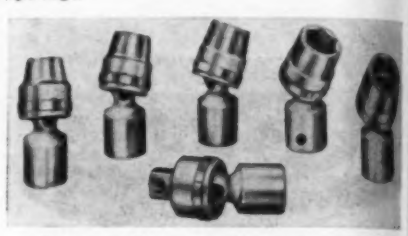
For further information write to *O'Neil-Irwin Mfg. Co., Lake City, Minn.*

For brief reference use IAVE — 0304.

PROTO BALL-TYPE UNIVERSAL SOCKETS

Five Proto universal power sockets and a universal joint, employing a ball-type coupling, have been announced by the Plomb Tool Company, Los Angeles, Calif.

They are designed for pneumatic or electric power-impact wrenches with 1/2-in. square drive, but are equally serviceable on adapter-equipped 3/8- and 3/4-in. drive wrenches. The sockets have 1/2-, 9/16-, 5/8-, 11/16-, and 3/4-in. hexagon (6-point) openings.



Porto ball-type universal sockets

They operate smoothly at all angles and will not back off the work because force is evenly and constantly applied and they have no "dead spots" common to block-type universals.

All parts are made of special steel, manufactured to close tolerances, and the ball part of the sockets is self-cleaning.

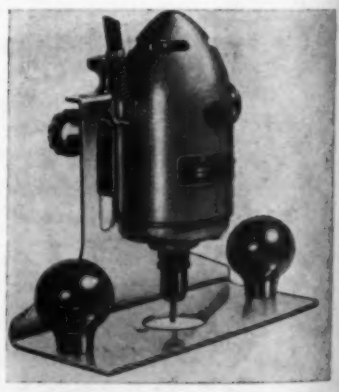
For further information write to *Plomb Tool Co., Los Angeles, Calif.*

For brief reference use IAVE — 0305.

NEW DUMORE ROUTER

A new fast, portable router is announced by The Dumore Company, Racine, Wis.

Working from any 115-v. outlet, powered by a 1/16-h.p. Dumore motor, the router develops 19,000 r.p.m. for fast, clean routing of wood, linoleum, formica, plastics, etc. Quick-change chuck has 1/4-in. capacity, and 1/8-, 3/16-, and 1/4-in. router bits are available. Adjustment for depth of cut is quickly made, and positively locked. Two large, correctly angled handles make router handling easy and accurate. Wide front opening gives clear view of cut, permitting accurate work.



New Dumore router

Two kits of attachments are available. Kit No. 1 contains a fence guide for edging and inlay work plus a template guide for duplicating work. Kit No. 2 contains a flexible shaft and pencil

(Continued on page 88A)

DIRECTORY OF MANUFACTURERS' PRODUCTS

This directory is published as a convenient guide to sources of supply, covering the products of manufacturers carrying product information in this ANNUAL NUMBER. For alphabetical index of manufacturers' advertising see page 95A. To obtain products not included in this directory, quotations or additional information to help you make up your specifications, lists of equipment, etc., address Industrial-Arts Service Division, or use coupon on page 96A.

ABRASIVE PAPER & CLOTH
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Mamie Mg. Co.

ABRASIVES — sand renew
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General Electric Co.
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Cincinnati Tool Co.

ANVIL TOOLS
Stanley Tools

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Delta Mfg. Co.
General Electric Co.
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AUTOMOTIVE TEST EQUIPMENT
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AUTOMOTIVE TOOLS AND EQUIPMENT
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AWLS, TINNERS
Millers Falls Co.
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Johnson Gas Appliance Co.

BABBITT METAL
Kester Solder Co.

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Duro Metal Products Co.
Walker-Turner Co., Inc.

BAND SAW BRAZERS, Electric
Atkins & Co., E. C.
Oliver Machinery Co.

BAND SAWS
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Boice Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
De Walt Products Corp.
Disston & Son, Inc., Henry
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Oliver Machinery Co.
Parks Woodworking Mach. Co.
Porter-Cable Machine Co.
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Oliver Machinery Co.
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BAND SAW SETS
Atkins & Co., E. C.

BATTERY CHARGERS
General Electric Co.

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BENCH VISES
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Sheldon & Co., E. H.
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Millers Falls Co.
North Brothers Mfg. Co.
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BITS, AUGER
Stanley Tools
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BITS, SCREW DRIVERS
Greenlee Tool Co.
Millers Falls Co.
North Brothers Mfg. Co.
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Stanely Tools

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Engineering Sales Company
Post Company, Frederick
Weber Co., F.

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Post Company, Frederick

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Hamilton Mfg. Co.
Post Company, Frederick
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Bennett Co., Chas. A.
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Bruce Publishing Company
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CABINETS, Furniture, Galleys, Ink, Type, and Rollers
American Type Founders Sales Corp.
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Starrett Co., L. S.

CARVING TOOLS for Wood and Linoleum
Brodhead-Garrett Co
Chicago Wheel & Mfg. Co.
Greenlee Tool Co.
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CEMENT
Borden Co.

CENTER LATHE
Atlas Press Co.
Cincinnati Lathe & Tool Co.
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Brodhead-Garrett Co.
Electric Hotpack Company, Inc.
Seeley's Ceramic Studio
Stewart Clay Co.
Weldon Laboratory, James W.

CHARTS
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SHOP EQUIPMENT NEWS

(Continued from page 86A)

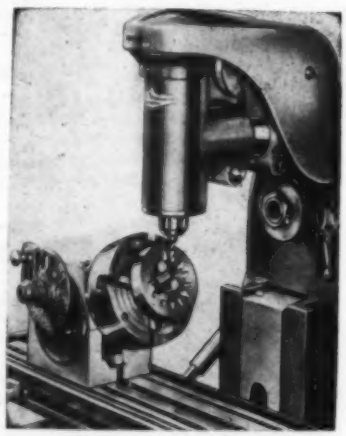
grip handpiece with ⅛- and 3/32-in. capacity chuck for converting router to a flexible shaft tool.

Full information and tool specifications will be sent free on request to *The Dumore Co., Racine, Wis.*

For brief reference use IAVE — 0306.

NEW VERTICAL MILL ATTACHMENT

Marvin Machine Products, Inc., of Detroit, Mich., is introducing a new improved, streamlined, vertical mill attachment.



Vertical mill attachment

Its precision, ruggedness, safety provisions, and versatility allow it to take the place and do the work of many specialized machines.

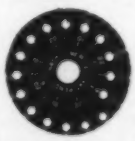
For further information address *Marvin Machine Products, Inc., 414 Ford Bldg., Detroit 26, Mich.*

For brief reference use IAVE — 0307.

THE LINERITE

This interesting drafting and layout tool makes easy the spacing and drawing of straight and curved parallel lines.

To use the Linerite place its edge against the straight or curved edge to which the parallel lines are to be drawn. Then insert the pencil or scriber in any of the 16 polygonal holes and slide it along thus making the parallel line.



The lines may be spaced from 1/64 to ¼ in. apart. For making shading effects, use the various holes chosen for the desired spaces between the lines, and draw them all before moving the guide.

Steel Linerites are available for metal work.

For complete information address *M. Nath, 4831 Woodhall Ave., Detroit 24, Mich.*

For brief reference use IAVE — 0308.

PERECO NEW GENERAL PURPOSE ELECTRIC HEAT-TREATING FURNACES

To answer the needs for single units that do the work of multiple equipment over the full range of heat-treating temperatures, Pereny Equipment Company has introduced the new Pereco "FG" Series Electric Furnaces in various load capacities. These general purpose units, equipped with Globar heating elements, are designed for heavy and continuous duty at all

(Continued on page 90A)

TO DO JOBS BETTER AND FASTER

there's Nothing like a **PLUMB**

The red handle with the black head exclusively PLUMB

QUALITY COMES FIRST PLUMB IS FIRST IN QUALITY

As soon as you use it you'll know it's a Plumb hammer. Fast, easy-swinging strokes strike hard and accurately. Its balance lessens fatigue—let's you do more without tiring.

First choice among men who use hand tools in their daily tasks, the Plumb hammer is engineered to do better work faster. The springy comfort-grip hickory handle absorbs shocks. The head is constructed of special analysis steel hardened at four separate points. There's no substitute for Plumb quality, one reason why wise dealers won't offer you something "just as good."

Get a Plumb hammer—you'll do more in less time.

HAMMERS
HATCHETS
AXES
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PLUMB

TOOLS ALWAYS SHARP WITH PLURALITY OILSTONE TOOL GRINDERS

No. 450 Plurality Jr.

NOW AVAILABLE IN 3 SIZES
No. 425 Plurality Sub Jr.
No. 450 Plurality Jr.
No. 475 Plurality

Grinding can be done on a cone, coarse or fine oilstone, leather stropping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

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HANOVER, PENNSYLVANIA
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

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COMPOSING STICKS
American Type Founders Sales Corp.
Rouse & Co., H. B.

CONDUITS
General Electric Co.

CONTROLLERS, ELECTRIC
General Electric Co.

COPING SAW BLADES
Atkins & Co., E. C.
Delta Mfg. Co.
Disston & Sons, Inc., Henry

COPING SAWS
Atkins & Co., E. C.

COPING SAWS, Power
Delta Mfg. Co.
Duro Metal Products Corp.
Walker-Turner Co., Inc.

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Stanley Tools
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CURVES, IRREGULAR
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Engineering Sales Company
Post Company, Frederick
Weber Company, F.

CUT-OFF SAWS
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Delta Mfg. Co.
De Walt Products Co.
Duro Metal Products Co.
Oliver Machinery Co.
Parks Woodworking Mach. Co.
Porter-Cable Machine Co.
Wallace & Co., J. D.
Yates-American Machine Co.

CUTTER HEADS
Atkins & Co., E. C.
Delta Mfg. Co.
Williams & Co., J. H.
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Duro Metal Products Co.
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Sjostrom Co., John E.
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Berger Scientific Supplies, Inc.
Dietzgen Co., Eugene
Elliott Co., B. K.
Engineering Sales Co.
Nath, M.
Post Company, Frederick
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South Bend Lathe Works
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Atlas Press Co.

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Rockford Machine Tool Co.
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Millers Falls Co.
Stanley Tools

DRILLS, CARVING FOR PLASTICS
Elbar Products

DRILLS, HAND
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Millers Falls Co.
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Gyro Lamp and Shade Corp.

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ELECTRIC MOTORS
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Boice Crane Company
Delta Mfg. Co.
General Electric Co.
Walker-Turner Co., Inc.

ELECTRIC SOLDERING IRONS
Stanley Tools

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Western States Envelop Co.

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Weston Electric Instrument Corp.

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American Type Founders Sales Corp.

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Disston & Sons, Inc., Henry
Foley Mfg. Co.

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FILMS, TEACHING, ETC.
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Post Company, Frederick
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Don Jer. Products

FLUX, SOLDERING
Kester Solder Co.
Ruby Chemical Company

FOLDING RULES
Millers Falls Co.
Stanley Tools

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Stanley Tools

FORGES, Annealing & Melting
American Gas Furnace Co.
Sunbeam Corp.

FORGES, GAS
American Gas Furnace Co.
Sunbeam Corp.

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Sterling Wheelbarrow Co.

FREQUENCY METERS Portable and Switchboard
Weston Electric Instrument Co.

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General Electric Co.
Johnson Gas Appliance Co.
Sunbeam Corp.

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Disston & Sons, Inc., Henry
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Stanley Tools
Starrett Co., L. S.

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Atlas Press Co.
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HANDEE is a basic "must" for every industrial arts class. It's the tool for really smooth, controlled power ...works in metal, wood, glass, bone, leather, etc. Internal carving in plastics. Grind, drill, carve, saw; other uses, too. Easy to instruct...easy to operate... students take to HANDEE readily! More HANDEE tools are in use today than all others combined!

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B&I *Pottery Maker*

POWER DRIVEN VARIABLE SPEED POTTER'S WHEEL

Compact, portable, mounts anyplace. Combines professional features and versatility never before available at such a popular price. Cast aluminum base finished in blue enamel. Precision-built for smooth long-lifed performance. Ideal for schools and home ceramic studios.

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DESIGNED FOR SCHOOL USE
ONLY **$57.50**

New variable speed reducer with adjustable foot control provides speed range from 38 to 130 RPM. Other features include built-in water container, attached wedging wire, reversible 9 inch throwing head with recess for molding plaster bats. Order by mail now . . . or write for complete literature.

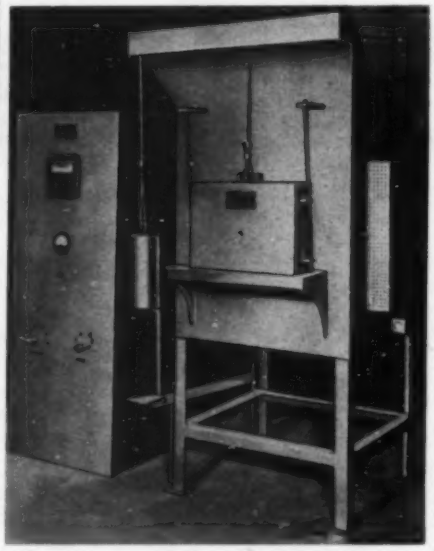
Mfd. by B & I Manufacturing Co., Burlington, Wis.

SHOP EQUIPMENT NEWS

(Continued from page 88A)

heat levels up to 2500° F., with higher temperatures available for short or intermittent runs.

Each of the furnaces has a separate, matching control panel unit, complete with indicating controller, transformer, current input meter with



New Pereco electrict heat-treating furnace

push-button reading, and magnetic contactor. To further extend coverage of the "FG" models to many special applications, a wide choice of standard makes or types of control (recording, program or cycle, excess temperature, etc.) also are available.

The heavy steel, electrically welded furnace case is gastight and has thick, superduty type insulation. Loading areas in the several models of this new series range from 8 in. wide, 10 in. deep, and 4 in. high, to 16 in. wide, 30 in. deep, and 12 in. high.

For further information address *Pereny Equipment, 893 Chambers Road, Columbus 12, Ohio.*
For brief reference use IAVE — 0309.

NEW 6-IN. HOME-UTILITY BENCH GRINDER

The Black & Decker Mfg. Co. of Towson, Md., have just introduced a 6-in. bench grinder to the line. It is especially designed for speeding up jobs in the home workshop or on the farm.

Powered by a Black & Decker ¼ h.p. motor, and supplied with general-purpose grinding wheel and wire wheel brush, this new bench grinder is especially handy for sharpening knives, tools, twist drills, shears, etc.; for removing rust, scale, old paint; and for cleaning, burnishing, and preparing surfaces for soldering and welding. The unit can be equipped with different grades of grinding wheels and with rag buff wheels for buffing and polishing.

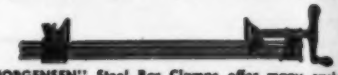
For further information address Black & Decker Mfg. Co., 680 Pennsylvania Ave., Towson 4, Md.
For brief reference use IAVE — 0310.

HOBART ARC WELDER CATALOG

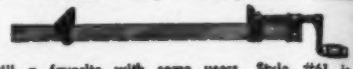
The Hobart Brothers Company has released a new 8-page, 2-color catalog containing illustrations, descriptions, dimensions, and specifications on its complete line of "simplified" arc welders. Various features comprising the machine are individually illustrated and described.

Specify and Insist Upon GENUINE "Jorgensen" TRADE MARK REG U S PAT OFF

STEEL BAR CLAMPS



"JORGENSEN" Steel Bar Clamps offer many exclusive desirable features. The "multiple disc clutch" holds securely, releases easily without notches or other deformity in the bar. Fast operating and economical — repairs easily made if ever necessary. Built to industrial standards, they will serve you best in the school shop. Style #70 "JORGENSEN" I-bar Clamps are a favorite — many other Styles are available.



Still a favorite with some users, Style #61 is a "notched bar" type steel bar clamp. Somewhat slower in operation than our "fast-operating" bar clamps, but just as carefully designed. Will provide long, satisfactory service.

"JORGENSEN" Handscrews are regarded as the "standard" everywhere for school-shop and industrial service. Jaws are carefully selected, properly seasoned hard maple, made in our own factory; cold-drawn steel spindles; hard maple handles will not come loose. Look for the trade-mark "JORGENSEN" on every jaw.

"Jorgensen" TRADE MARK REG U S PAT OFF AND "Pony" U S PAT OFF

Steel Bar Clamps, "C" Clamps, Handscrews, Clamp Fixtures, Press Screws, Lathe Dogs, etc., are available thru your favorite tool supplier — cost no more than ordinary clamps!

CATALOG SENT FREE UPON REQUEST

ADJUSTABLE CLAMP COMPANY
"The Clamp Folks"
424 No. Ashland Ave. Chicago 22, Ill.

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SOFT ALUMINUM CIRCLES

20 Gauge (.032")		16 Gauge (.051")		14 Gauge (.064")	
Size	Each	Size	Each	Size	Each
4" dia.	5¢	8" dia.	25¢	10" dia.	50¢
18 Gauge (.040")		10" dia.	45¢	12" dia.	65¢
Size	Each	12" dia.	55¢	14" dia.	95¢
4" dia.	10¢	14" dia.	80¢	16" dia.	$1.10
6" dia.	15¢	16" dia.	$1.00	18" dia.	$1.40
8" dia.	20¢	18" dia.	$1.20	20" dia.	$1.75
10" dia.	35¢	20" dia.	$1.40	22" dia.	$2.00
12" dia.	45¢			24" dia.	$2.40
14" dia.	65¢				
16" dia.	80¢				
18" dia.	95¢				

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Stanley Electric Tools

HAND SAWS
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Disston & Sons, Inc., Henry
Millers Falls Co.

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HEAT-TREATING EQUIPMENT
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Electric Hotpack Company, Inc.
Johnson Gas Appliance Co.
Sunbeam Corp.

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Weston Electric Instrument Co.

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Post Company, Frederick
Weber Company, F.

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Higgins Ink Co., Inc.
Post Company, Frederick
Weber Company, F.

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Driscoll & Co., Martin

JACKETS, SNAP, FLASK, AND MOLD
Oliver Machinery Co.

JACKS, HYDRAULIC
Blackhawk Mfg. Co.

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De Walt Products Co.
Disston & Sons, Inc., Henry
Duro Metal Products Co.
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Walker-Turner Co., Inc.
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Yates-American Machine Co.

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Yates-American Machine Co.

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Disston & Sons, Inc., Henry
Woodworker's Tool Works
Yates-American Machine Co.

KNIVES, PAPER CUTTER
American Type Founders Sales Corp.

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Williams & Co., J. H.

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General Electric Co.

LATHE ATTACHMENTS
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Atlas Press Co.
Cincinnati Lathe & Tool Co.
Dumore Company, The
South Bend Lathe Works

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Boice Crane Company
Duro Metal Products Co.
LeBlond Machine Tool Co., R. K.
Logan Engineering Co.
Sheldon Machine Co., Inc.
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Boice Crane Company
Walker-Turner Co., Inc.

LATHES, SMALL PRECISION
Atlas Press Co.

LATHES, SPINNING
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Walker-Turner Co., Inc.

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Delta Mfg. Co.
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Duro Metal Products Co.
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Shopsmith
Walker-Turner Co., Inc.
Wallace & Co., J. D.
Yates-American Machine Co.

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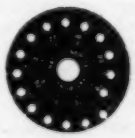

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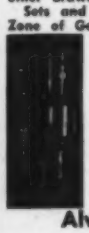

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